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PHARMACOLOGIA;

COMPREHENDING

The Art of Prescribing

UPON

FIXED AND SCIENTIFIC PRINCIPLES;

TOGETHER WITH THE

HISTORY OF MEDICINAL SUBSTANCES.

BY J. A. PARIS, M.D. F.R.S. F.L.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON; HONORARY
MEMBER OF THE BOARD OF AGRICULTURE; FELLOW OF THE PHILOSOPHICAL SOCIETY OF CAMBRIDGE; AND OF THE ROYAL
MEDICAL SOCIETY OF EDINBURGH; AND LATE
SENIOR PHYSICIAN TO THE WESTMINSTER HOSPITAL, &c.

> Quis Pharmacopœo dabit leges, ignarus ipse agendorum?—Vix profecto dici potest, quantum hæc ignorantia rei medicæ inferat detrimentum.
>
> GAUB: METHOD: CONCINN: FORMUL.

Second American, from the Fifth [enlarged] London Edition.

WITH ADDITIONS AND ILLUSTRATIONS OF THE MATERIA MEDICA
OF THE UNITED STATES,

BY ANSEL W. IVES, M.D.

FELLOW OF THE COLLEGE OF PHYSICIANS AND SURGEONS OF THE
UNIVERSITY OF THE STATE OF NEW-YORK, &c.

IN TWO VOLUMES.—VOL. I.

New-York:

F. & R. LOCKWOOD,—154 BROADWAY.
J. & J. Harper, Printers.

1824.

BOSTON MEDICAL LIBRARY
IN THE
FRANCIS A. COUNTWAY
LIBRARY OF MEDICINE

Southern District of New-York, ss.

BE IT REMEMBERED, that on the seventeenth day of October, in the forty-eighth year of the Independence of the United States of America, F. & R. Lockwood, of the said district, have deposited in this office the title of a book, the right whereof they claim as proprietors, in the words following, to wit—

"Pharmacologia; comprehending the Art of Prescribing upon fixed and scientific Principles; together with the History of Medicinal Substances. By J. A. Paris, M.D. F.R.S. F.L.S. Fellow of the Royal College of Physicians of London; Honorary Member of the Board of Agriculture; Fellow of the Philosophical Society of Cambridge; and of the Royal Medical Society of Edinburgh; and late Senior Physician to the Westminster Hospital, &c.

Quis Pharmacopœo dabit leges, ignarus ipse agendorum?—Vix profecto dici potest, quantum hæc ignorantia rei medicæ inferat detrimentum.—*Gaub: Method: Concinn: Formul.*

Second American, from the fifth [enlarged] London Edition. With Additions and Illustrations of the Materia Medica of the United States. By Ansel W. Ives. M.D. Fellow of the College of Physicians and Surgeons of the University of the State of New-York, &c."

In conformity to the Act of the Congress of the United States, entitled "An Act for the encouragement of learning, by securing the copies of maps, charts, and books to the authors and proprietors of such copies, during the times therein mentioned:" And also, to an Act, entitled "An Act supplementary to the Act, entitled an Act for the encouragement of learning, by securing the copies of maps, charts, and books to the authors and proprietors of such copies, during the times therein mentioned, and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

JAMES DILL,
Clerk of the Southern District of New-York.

TO

WILLIAM GEORGE MATON, M.D. F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, VICE-PRESIDENT
OF THE LINNÆAN SOCIETY, &c. &c. &c.

My Dear Sir,

There is not an individual in the whole circle of the profession, to whom I could with greater satisfaction, or with so much propriety, dedicate this work as to yourself.

Ardent and zealous in the advancement of our science, you must deeply deplore the prejudices that retard its progress;—eminently enlightened in Natural History, you can justly appreciate the importance of its applications to Medicine; while your well-known earnestness in upholding the dignity, and in encouraging the legitimate exercise of our profession, marks you as the most proper patron of a work, the aim of which is to extinguish the false lights of empiricism, and to substitute a steady beacon on the solid and permanent basis of truth and science: at the same time, the extensive practice which your talents and urbanity so justly command in this metropolis, must long since have taught you the full extent of that empiricism which it has been my endeavour to expose, and the practical mischief of that ignorance which it has been my object to enlighten.

Nor let me omit to mention the claims of that friendship which has for many years subsisted between us; be assured that I am gratefully sensible of those personal obligations which so fully justify this public avowal of them; confidently trusting that you will not measure the gratitude which your kindness has inspired, by the merits of the offering by which it is acknowledged, but rather by the truth and sincerity of the Dedication, by which I am enabled to express

My respect for your talents;
esteem for your virtues;
and wishes for your happiness;

JOHN AYRTON PARIS.

Dover-Street, October, 1822.

ADVERTISEMENT

TO

THE FIFTH EDITION.

NEARLY twelve months have elapsed since the Fourth Edition was pronounced by my Publisher to be *out of print*. An anxious desire to render the work worthy of the very liberal patronage which it has received from the medical profession, is the only apology I have to offer for a delay which might be mistaken for apathy.

The increased size of the work, has induced me to publish the present edition in two volumes; an arrangement which will be found perfectly consistent with the original design, and with the distinct objects of study and reference for which it was calculated. The increase of materials has been, in some measure, derived from the communications which I have received from English practitioners; and from the recently extended researches of the French and German Chemists; but principally from the farther developement of those views respecting the *primary* and *secondary* operations of medicinal bodies, which were announced, but not explained, in the former editions.

To the first volume an extensive index has been added, at the suggestion of Sir Gilbert Blane, who expressed an opinion that my Essay on Medicinal Combination might be enhanced in practical utility by affording to the Student a readier access to its precepts and illustrations; an improvement which I have just been informed, by a letter from New-York, has been anticipated by the American publishers, in an edition lately reprinted in that country.

In the enumeration of the *Officinal Formulæ*, I have, for the sake of avoiding confusion, designated the *modus operandi* of the principal ingredients, by the *old English* letters, placed in brackets, after each preparation, and which correspond with the *key letters* displayed in the synoptical table in the first volume.

The reader will perceive that the list of *Patent* Medicines, or *Nostrums*, has been considerably extended; and the author cannot cease to deplore a credulity which should uphold and cherish so disgraceful and mischievous a system of treachery and imposture.

J. A. P.

PREFACE

TO THE

SECOND AMERICAN EDITION.

When the first American Edition of Dr. Paris's Pharmacologia was published, few physicians in this country were acquainted, either with the character of the work or the reputation of its Author. It was preceded by no recommendations to professional favour, nor was it subsequently honoured, even by the customary introduction of a critical review. It soon, however, obtained celebrity by its merits. Its popularity has been evinced by the sale of a large edition published the last year.

Dr. Paris's happy illustration of the operation of medicines, as diversified by combination, appears to be peculiarly his own; and he has so far succeeded in reducing his principles to scientific accuracy, and in rendering them applicable to practice, as justly to merit the praise of forming a new era in the departments of Pharmacy and Prescription. In the *Fifth London Edition*, which is here reprinted, it will be perceived that the author has greatly enlarged the FIRST PART—the most original and interesting portion of the work; and thus, by supplying an important deficiency in his previous editions, has rendered his book complete. In its present form, it is entitled to the double commendation, of being a work admirably suited to the wants of the profession, and the only one of its kind.

The author has probably introduced, into the second volume, every article of the Materia Medica, which he thinks worthy of being retained in use; but there are, unquestionably, many valuable medicines of American production, which it is presumed are known but imperfectly, if at all to him, and a description of which, it is believed, will render the work more useful to the profession in this country. From this consideration, the American Editor has attempted to incorporate, in this edition, a brief notice of the most valuable medicinal substances of the United States. In pursuance of this object, he has endeavoured to conform, generally, to the plan, and to imitate, as far as practicable, the brevity of the Author. This alone is a sufficient reason for excluding several articles which doubtless possess medicinal virtues, and were appropriately introduced into the American Pharmacopœia, but which have yet but an unsettled character. If a few articles, which have heretofore received but little notice, appear to be treated with unmerited attention, it is because the editor has tested their virtues, can vouch for their merits, and is therefore desirous of rendering them more conspicuous. On the other hand, he has investigated, with considerable labour and perseverance, the chemical and medicinal qualities of many vegetables of supposed value, and the results have shown them unworthy of further notice.

In making this selection, the Editor has been unwilling to multiply new remedies, or to hazard the introduction of such as may be found of no value. And as he wished to form an opinion of their medicinal virtues, not less from his personal observation than from the testimony of others, he is more apprehensive that the number of substances admitted is too limited than too large. Error of deficiency on this subject, however, will be regarded as the lesser evil of the two, while the reader has access to the valuable and more comprehensive writings of the Bartons, Bigelow, Coxe, Thatcher, Dyckman, Chapman, and Eberle.

To avoid increasing the confusion which has resulted from a multiplicity of synonyms, and which has greatly retarded the progress of our Materia Medica, the Editor has copied, from the American Pharmacopœia, the scientific and vulgar names of such of the articles as are noticed in that work. And as the writings of Bigelow and Barton, not only constitute the basis of this department of American Science, but really furnish the most accurate and extensive information relating to most of the vegetables of which they have treated, he has also followed the example of the Pharmacopœia in referring to them, on every article which has been the subject of their investigation.

The Editor has thought it expedient to deviate from the plan of the author, by briefly describing the *specific character* of most of the indigenous vegetables here noticed; presuming that few members of the profession are so familiar with them all, as to be able to identify them by their sensible properties. He has also dispensed with any remarks on *adulterations* and *incompatible substances:* for most of the plants in question are found growing so abundantly, and may be so easily procured of the best quality, that no inducement exists to fraudulent adulterations; and, with regard to their incompatibility with other substances, it is only necessary to advert to the small number and uniform similarity of the proximate principles of most vegetables that have been analyzed, to perceive that a very limited acquaintance with this branch of chemistry will enable the physician, in every instance, after knowing the chemical composition of the article, readily to determine what combinations with it are incompatible.

The additions, in the second volume, by the American Editor, are, for the sake of convenience, introduced into the body of the work; they are preceded and closed with rules,—enclosed in brackets, and signed by the letter I. In the index, the names of the articles he has added or treated of are printed in italics.

A. W. IVES.

Park Place, November, 1823.

ings. That the design however of the present work may not be mistaken, it is essential to remark that it is elementary only in reference to the art of prescribing, for it is presumed that the student is already acquainted with the common manipulations of pharmacy, and with the first principles of chemistry. When any allusions are made to the processes of the Pharmacopœia, they are to be understood as being only supplementary, or as explanatory of their nature, in reference to the application or medicinal powers of the substance in question. The term PHARMACOLOGIA, as applied to the present work, may therefore be considered as contradistinctive to that of PHARMACOPŒIA; for while the latter denotes the processes for *preparing*, the former comprehends the scientific methods of *administering* medicinal bodies, and explains the objects and theory of their operation. The articles of the Materia Medica have been arranged in alphabetical order, not only as being that best calculated for reference, but one which, in an elementary work at least, is less likely to mislead, than any arrangement founded on their medicinal powers; for in consequence of the difficulty of discriminating in every case between the primary and secondary effects of a medicine, substances very dissimilar in their nature have been enlisted into the same artificial group, and when several such bodies have, from a reliance upon their unity of action, been associated together in a medicinal mixture, it has too often happened that, like the armed men of Cadmus, they have opposed and destroyed each other. The object and application of the antique marginal letters, to which the name of *Key Letters* has been given, are fully explained in the First Part of the work, and it is hoped, that the scheme possesses a more substantial claim to notice than that of mere novelty: it will be perceived that in the enumeration of the officinal formulæ these letters are also occasionally introduced, to express the manner in which the particular substance, under the head of which it stands, operates in the combination. If any apology be necessary for the introduction of the medicinal formulæ, it may be offered in the words of Quintillian, who very justly observes, "*In omnibus fere minus valent præcepta quam exempla*;" or in the language of Seneca; "*Longum est iter per præcepta, breve et efficax per exempla.*" Under the history of each article, I have endeavoured to concentrate all that is required to be known for its efficacious administration, such as, 1. *Its sensible qualities*. 2. *Its chemical composition*, or the constituents in which its medicinal activity resides. 3. *Its relative solubility in different menstrua, and the proportions in which it should be mixed, or combined with different bodies, in order to produce suspension, or saturation*. 4. *The Incompatible Substances*; that is to say, those substances which are capable of destroying its properties, or of rendering its flavour or aspect unpleasant or disgusting. 5. *The most eligible forms in which it can be exhibited*. 6. *Its specific doses*. 7. *Its Medicinal Uses, and Effects*. 8. *Its*

Preparations, *Officinal* as well as *Extemporaneous*. 9. *Its Adulterations*. That such information is indispensable for the elegant and successful exhibition of a remedy, must be sufficiently apparent; the injurious changes and modifications which substances undergo when they are improperly combined by the ignorant practitioner, are not, as some have supposed, imaginary, the mere *deliramenta doctrinæ*, or the whimsical suggestions of theoretical refinement, but they are really such as to render their powers unavailing, or to impart a dangerous violence to their operation. "*Unda dabit flammas et dabit ignis aquas.*"

In the history of the different medicinal preparations, the pharmacopœia of the London College is the standard to which I have always referred, although it will be perceived that I have frequently availed myself of the resources with which the pharmacopœias of Edinburgh and Dublin abound. To a knowledge of the numerous adulterations to which each article is so shamefully exposed, too much importance can be scarcely attached; and under this palpable source of medicinal fallacy and failure, may be very fairly included those secret and illegitimate deviations from the acknowledged modes of preparation, as laid down in the pharmacopœia, whether practised as expedients to obtain a lucrative notoriety, or from a conceit of their being improvements upon the ordinary processes; for instance, we have lately heard of a wholesale chemist who professes to supply a syrup of roses of very superior beauty, and who for this purpose substitutes the petals of the *red* (rosa gallica) for those of the *damask* rose (rosa centifolia;) we need not be told, that a preparation of a more exquisite colour may be thus afforded, but allow me to ask if this *underhanded* substitution be not a manifest act of injustice to the medical practitioner, who instead of a laxative syrup, receives one which is marked by the opposite character of astringency. These observations will not apply, of course, to those articles which are *avowedly* prepared by a new process; for in that case the practitioner is enabled to make his election, and either to adopt or refuse them at his discretion. Thus, since the article *Extracta* in this work has been printed off, Mr. Barry has applied his ingenious patent apparatus for boiling *in vacuo*, to the purpose of making Extracts; we might almost say, *a priori*, that the results must be more active than those obtained in the ordinary way, but they must pass the ordeal of experience before they can be admitted into practice. As a brief notice of the most notorious *Quack Medicines* may be acceptable, the formulæ for their preparation have been appended in notes, each being placed at the foot of the particular article which constitutes its prominent ingredient; indeed it is essential that the practitioner should be acquainted with their composition, for although he would refuse to superintend the operation of a boasted *panacea*, it is but too probable that he may be called upon to counteract its baleful influence.

From what has been thus stated, it will appear that the volume now presented to the public has been so enlarged in its bulk and extended in its views, that it rather merits the appellation of a new work, than that of a renewed edition of a former one.

The *Historical Introduction*, comprehending the substance of the lectures delivered before the Royal College of Physicians of London, from the recently established chair of Materia Medica, has been prefixed to the work, at the desire of several of the auditors; and I confess my readiness to comply with this request, as it enabled me at once to obviate any misconception or unjust representation of those remarks which I felt it my bounden duty to offer to the College.

It will be observed that the work itself is divided into two separate and very distinct parts, the *First* comprehending the principles of the art of combination,—the *Second*, the medicinal history, and chemical habitudes of the bodies which are the subjects of such combination. These comprise every legitimate source of instruction, and to the young and industrious student, they are at once the LOOM and the RAW MATERIAL. Let him therefore abandon those flimsy and ill adapted textures, that are kept ready fabricated for the service of ignorance and indolence, and by actuating the machinery himself, weave the materials with which he is here presented into the forms and objects that may best fulfil his intentions, and meet the various exigencies of each particular occasion.

J. A. P.

Dover-street, January, 1822.

HISTORICAL INTRODUCTION.

COMPREHENDING
THE
SUBSTANCE OF SEVERAL LECTURES
DELIVERED BY THE AUTHOR
BEFORE THE
Royal College of Physicians,
FROM THE
CHAIR OF MATERIA MEDICA,
In the Years 1819, 20, and 21.

> "It has been very justly observed that there is a certain maturity of the human mind acquired from generation to generation, in the MASS, as there is in the different stages of life in the INDIVIDUAL man;—What is history, when thus philosophically studied, but a faithful record of this progress? pointing out for our instruction the various causes which have retarded or accelerated it in different ages and countries."
>
> *Historical Introduction, p.* 18.

HISTORICAL INTRODUCTION.

AN ANALYTICAL INQUIRY INTO THE MORE REMARKABLE CAUSES WHICH HAVE, IN DIFFERENT AGES AND COUNTRIES, OPERATED IN PRODUCING THE REVOLUTIONS THAT CHARACTERIZE THE HISTORY OF MEDICINAL SUBSTANCES.

BEFORE I proceed to discuss the particular views which I am prepared to submit to the College, on the important but obscure subject of medicinal combination, I propose to take a sweeping and rapid sketch of the different moral and physical causes which have operated in producing the extraordinary vicissitudes, which so eminently characterize the history of Materia Medica. Such an introduction is naturally suggested by the first glance at the extensive and motley assemblage of substances with which our cabinets* are overwhelmed. It is impossible to cast our eyes over such multiplied groups, without being forcibly struck with the palpable absurdity of some—the disgusting and loathsome nature of others—the total want of activity in many—and the uncertain and precarious reputation of all—or, without feeling an eager curiosity to inquire, from the combination of what causes it can have happened, that substances, at one period in the highest esteem, and of generally acknowledged utility, have fallen into total neglect and disrepute;—why others, of humble pretensions, and little significance, have maintained their ground for so many centuries; and on what account, materials, of no energy whatever, have received the indisputable sanction, and unqualified support, of the best and wisest practitioners of the age. That such fluctuations in opinion and versatility in practice, should have produced, even in the most candid and learned observers, an unfavourable impression with regard to the general efficacy of medicines, can hardly excite our astonishment, much less our indignation ; nor can we be surprised to find, that another portion of mankind has at once arraigned Physic as a fallacious art, or derided it as a composition of error and fraud.* They ask—and it must be confessed that they ask with reason—what pledge can be afforded them, that the boasted remedies of the present day will not, like their predecessors, fall into disrepute, and in their turn, serve only as humiliating memorials of the credulity and infatuation of the physicians who commended and prescribed them? There is surely no question connected with our subject, which can be more interesting and important, no one which requires a more cool and dispassionate inquiry, and certainly not any which can be more appropriate for a lecture, introductory to the history of Materia Medica. I shall therefore proceed to examine with some attention the revolutions which have thus taken place in the opinions and belief of mankind, with regard to the efficacy and powers of different medicinal agents ; such an inquiry, by referring them to causes capable of a philosophical investigation, is calculated to remove many of the unjust prejudices which have been excited, to quiet the doubts and alarms which have been so industriously propagated, and, at the same time, to obviate the recurrence of several sources of error and disappointment.

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* The College of Physicians may now be said to possess one of the most complete collections of Materia Medica in Europe. That collected by Dr. Burgess, and presented to the College after his death by Mr. Brande, to whom it was bequeathed, has lately been collated with the cabinet of Dr. Combe, purchased for that purpose. Its arrangement has been directed by a feeling of convenience for reference, rather than by any theoretical views relative to the natural, chemical, and medicinal histories of its constituent parts. Under proper regulations, it is accessible to the studious and respectable members of the profession.

This moral view of events, without any regard to chronological minutiæ, may be denominated the PHILOSOPHY OF HISTORY, and should be carefully distinguished from that technical and barren erudition, which consists in a mere knowledge of *names* and *dates*, and which is perused by the medical student with as much apathy, and as little profit, as monks count their bead-roll. It has been very justly observed, that there is a certain maturity of the human mind, acquired from generation to generation, in the *mass*, as there is in the different stages of life, in the *individual* man ; what is history, when thus philosophically studied, but the faithful record of this progress ? pointing out for our instruction the various causes which have retarded or accelerated it in different ages and countries.

In tracing the history of the Materia Medica to its earliest periods, we shall find that its progress towards its present advanced state, has been very slow and unequal, very unlike the steady and successive improvement which has attended other branches of natural knowledge; we shall perceive even that its advancement has been continually arrested, and often entirely subverted, by the caprices, prejudices, superstitions, and knavery of mankind; unlike too the other branches of science, it is incapable of successful generalization; in the progress of the history of remedies, when are we able to produce a discovery or improvement, which has been the result of that happy combination of Observation, Analogy, and Experiment, which has so eminently rewarded the labours of modern science? Thus, OBSERVATION led Newton to discover, that the refractive power of transparent substances was, in general, in the ratio of their density, but, that of substances of equal density, those which possessed the refractive power in a higher degree were inflammable. ANALOGY induced him to conclude that, on this account, water even must contain an inflammable principle, and EXPERIMENT enabled Cavendish and Lavoisier to demonstrate the surprising truth of Newton's induction, in their immortal discovery of the chemical composition of that fluid. The history of Astronomy will furnish another illustration equally beautiful and instructive,—Professor Kant *observed* an unequal space in the distance that separates Saturn and Jupiter; by *Analogy* he conjectured that another Planet would be found to occupy the interval; a supposition which was happily confirmed by a telescopic *experiment*, in the discovery of Uranus, by Herschel. But it is clear that such principles of research, and combination of methods, can rarely be applied in the investigation of remedies, for every problem which involves the phenomena of life is unavoidably embarrassed by circumstances, so complicated in their nature, and fluctuating in their operation, as to set at defiance every attempt to appreciate their influence; thus an observation or experiment upon the effects of a medicine, is liable to a thousand fallacies, unless it be carefully repeated under the various circumstances of health and disease, in different climates, and on different constitutions. We all know how very differently opium, or mercury, will act upon different individuals, or even upon the same individual, at different times, or under different circumstances; the effect of a stimulant upon the living body is not in the ratio of the intensity of its impulse, but in proportion to the degree of excitement, or vital susceptibility of the individual to whom it is applied: this is illustrated in a clear and familiar manner, by the very different sensations of heat which the same temperature will produce under different circumstances: in the road over the Andes, at about half way between the foot and the summit, there is a cottage in which the ascending and descending travellers meet; the former, who have just quitted the sultry valleys at the base, are so relaxed, that the sudden diminution of temperature produces in them the feeling of intense cold, whilst the latter, who have left the frozen summits of the mountain, are overcome by the distressing sensation of extreme heat. But we need not climb the Andes for an illustration; if we plunge one hand into a basin of hot, and the other into one of cold water, and then mix the contents of each vessel, and replace both hands in the mixture, we shall experience the sensation of heat and cold, from one and the same medium; the hand, that had been previously in the hot, will feel cold, whilst that which had been immersed in the cold water, will experience a sensation of heat. Upon the same principle, ardent spirits will produce very opposite effects upon different constitutions and temperaments, and we are enabled to reconcile the conflicting testimonies respecting the powers of opium in the cure of fever: aliments, also, which under ordinary circumstances would occasion but little effect, may in certain conditions of the system, act as powerful stimulants: a fact which is well exemplified by the history of persons who have been enclosed in coal mines for several days without food, from the accidental falling in of the surrounding strata, when they have been as much intoxicated by a basin of broth, as a person, in common circumstances, would have been by two or three bottles of wine.* Many instances will suggest themselves to the practitioner in farther illustration of these views, and I shall have occasion to recur to the subject at a future period.

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* A late foreign writer, impressed with this sentiment, has given the following *flattering* definition of our profession. "*Physic is the art of amusing the patient, while Nature cures his disease.*"

To such causes we must attribute the barren labours of the ancient empirics, who saw without discerning, administered without discriminating, and concluded without reasoning; nor should we be surprised at the very imperfect state of the materia medica, as far as it depends upon what is commonly called experience, complicated as this subject is by its numberless relations with Physiology, Pathology, and Chemistry. John Ray attempted to enumerate the virtues of plants from *experience*, and the system serves only to commemorate his failure: Vogel likewise professed to assign to substances, those powers which had been learnt from accumulated experience; and he speaks of *roasted toad* as a specific for the pains of gout, and asserts that a person may secure himself for the whole year from angina, by eating a roasted swallow! Such must ever be the case, when medicines derive their origin from false experience, and their reputation from blind credulity.

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* Elizabeth Woodcock, who was buried in the Snow, for the space of eight days, in the neigbourhood of Cambridge, and whom I frequently visited, died in consequence of the stimulants which she could not resist, and which in her peculiar state of excitement she was unable to bear. In the first volume of the Memoirs of the Philosophical Society of Manchester, a case of a Miner is recorded, who after remaining for eight days without food, was killed by being placed in a *warm* bed, and fed with chicken-broth.

ANALOGY has undoubtedly been a powerful instrument in the improvement, extension, and correction of the materia medica, but it has been chiefly confined to modern times; for in the earlier ages, Chemistry had not so far unfolded the composition of bodies, as to furnish any just idea of their relations to each other, nor had the science of Botany taught us the value and importance of the natural affinities which exist in the vegetable kingdom.

With respect to the fallacies to which such analogies are exposed, I shall hereafter speak at some length, and examine the pretensions of those *ultra* chemists of the present day, who have, upon every occasion, arraigned, at their self-constituted tribunal, the propriety of our medicinal combinations, and the validity of our national pharmacopœias.

In addition to the obstacles already enumerated, the progress of our knowledge respecting the virtues of medicines, has met with others of a moral character, which have deprived us in a great degree of another obvious method of research, and rendered our dependence upon testimony uncertain, and often entirely fallacious. The human understanding, as Lord Bacon justly remarks, is not a mere faculty of apprehension, but is affected, more or less, by the will and the passions; what man wishes to be true, that he too easily believes to be so, and I conceive that physic has, of all the sciences, the least pretensions to proclaim itself independent of the empire of the passions.

In our researches to discover and fix the period when remedies were first employed for the alleviation of bodily suffering, we are soon lost in conjecture, or involved in fable; we are unable to reach the period in any country, when the inhabitants were destitute of medical resources, and we find among the most uncultivated tribes, that medicine is cherished as a blessing, and practised as an art, as by the inhabitants of New Holland and New Zealand, by those of Lapland and Greenland, of North America, and of the interior of Africa. The personal feelings of the sufferer, and the anxiety of those about him, must in the rudest state of society, have incited a spirit of industry and research to procure alleviation, the modification of heat and cold, of moisture and dryness; and the regulation and change of diet and habit, must have intuitively suggested themselves for the relief of pain, and when these resources failed, charms, amulets, and incantations,* were the natural expedients of the barbarian ever more inclined to indulge the delusive hope of superstition, than to listen to the voice of sober reason. Traces of amulets may be discovered in very early history. The learned Dr. Warburton is evidently wrong, when he assigns the origin of these magical instruments to the age of the Ptolemies, which was not more than 300 years before Christ; this is at once refuted by the testimony of Galen, who tells us that the Egyptian king, Nechepsus, who lived 630 years before the Christian era, had written, that a green jasper cut into the form of a dragon surrounded with rays, if applied externally, would strengthen the stomach and organs of digestion. We have moreover the authority of the Scriptures in support of this opinion; for what were the earrings which Jacob buried under the oak of Shechem, as related in Genesis, but amulets? and we are informed by Josephus, in his Antiquities of the Jews,† that Solomon discovered a plant efficacious in the cure of Epilepsy, and that he employed the aid of a charm or spell for the purpose of assisting its virtues; the root of the herb was concealed in a ring, which was applied to the nostrils of the Demoniac, and Josephus remarks that he himself saw a Jewish Priest practise the art of Solomon with complete success in the presence of Vespasian, his sons, and the tribunes of the Roman army.‡ Nor were such means confined to dark and barbarous ages; Theophrastus pronounced Pericles to be insane, because he discovered that he wore an amulet about his neck; and, in the declining era of the Roman empire, we find that this superstitious custom was so general, that the Emperor Caracalla was induced to make a public edict ordaining that no man should wear any superstitious amulets about his person.

In the progress of civilization, various fortuitous incidents,‖

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* Ancient charms were frequently chanted, or sung, to which greater efficacy was ascribed; and a belief in the curative powers of music has even extended to later times. In the last century, Orazio Bonivoli composed a mass for the cessation of the plague at Rome. It was performed in St. Peter's church, of which he was *Maestro di Chapella*, and the singers, amounting to more than two hundred, were arranged in different circles of the dome; the sixth choir occupying the summit of the cupola.

† Lib. viii. c. 2. 5.

‡ From this Art of Solomon, exhibited through the medium of a ring, or seal, we have the eastern stories which celebrate the SEAL OF SOLOMON, and record the potency of its sway over the various orders of Demons, or of Genii, who are supposed to be the invisible tormentors or benefactors of the human race.

‖ Let the tradition respecting the discovery of the virtues of the Bark serve and even errors in the choice and preparation of aliments, must have gradually unfolded the remedial powers of many natural substances; these were recorded, and the authentic history of medicine may date its commencement from the period when such records began. The Chaldeans and Babylonians, we are told by Herodotus, carried their sick to the public roads and markets, that travellers might converse with them, and communicate any remedies, which had been successfully used in similar cases; this custom continued during many ages in Assyria; and Strabo states that it prevailed also among the ancient Lusitanians, or Portuguese: in this manner, however, the results of experience descended only by oral tradition; it was in the temple of Esculapius in Greece, that medical information was first recorded; diseases and cures were there registered on durable tablets of marble; the priests* and priestesses, who were the guardians of the temple, prepared the remedies and directed their application, and thus commenced the profession of physic. With respect to the actual nature of these remedies, it is useless to inquire; the lapse of ages, loss of records, change of language, and ambiguity of description, have rendered every learned research unsatisfactory; indeed we are in doubt with regard to many of the medicines which even Hippocrates employed. It is however clearly shown by the earliest records, that the ancients were in the possession of many powerful remedies; thus Melampus of Argos, the most ancient Greek physician with whom we are acquainted, is said to have cured one of the Argonauts of sterility, by administering the rust of iron in wine for ten days; and the same physician used hellebore as a purge, on the daughters of king Prætus, who were afflicted with melancholy. Venesection was also a remedy of very early origin, for Podalirius, on his return from the Trojan war, cured the daughter of Damethus, who had fallen from a height, by bleeding her in both arms. Opium, or a preparation of the poppy, was certainly known in the earliest

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as an illustration. We are told, that an Indian being ill of a fever, quenched his thirst at a pool of water, strongly impregnated with the bark from some trees having accidentally fallen into it, and that he was in consequence cured.

[*] As these persons were ambitious to pass for the descendants of Esculapius, they assumed the name of The ASCLEPIADES. The writings of Pausanius, Philostratus, and Plutarch, abound with the artifices of those early physicians. Aristophanes describes in a truly comic manner the craft and pious avarice of these godly men, and mentions the dexterity and promptitude with which they collected, and put into their bags, the offerings on the altar. The patients, during this period, reposed on the skins of sacrificed rams, in order that they might procure celestial visions. As soon as they were believed to be asleep, a priest, clothed in the dress of Esculapius, imitating his manners, and accompanied by the daughters of the god, that is, by young actresses, thoroughly instructed in their parts, entered, and delivered a medical opinion.

ages; it was probably opium that Helen mixed with wine, and gave to the guests of Menelaus, under the expressive name of *nepenthe*,* to drive away their cares, and increase their hilarity, and this conjecture receives much support from the fact, that the *nepenthe* of Homer was obtained from the Egyptian Thebes;† and if we may credit the opinion of Dr. Darwin, the Cumæan Sibyl never sat on the portending tripod without first swallowing a few drops of the juice of the *Cherry-laurel*.

> "At Phœbi nondum patiens, immanis in antro
> Bacchatur Vates, magnum si pectore possit
> Excussisse deum: tanto magis ille fatigat
> Os rabidum, fera corda domans, fingitque premendo."
> ÆNEID. lib. vi. 78.

There is reason to believe that the Pagan priesthood were under the influence of some powerful narcotic during the display of their oracular powers, but the effects produced would seem to resemble rather those of Opium, or perhaps of Stramonium, than of the Prussic acid. Monardes tells us that the priests of the American Indians, whenever they were consulted by the chief gentlemen, or *casiques* as they are called, took certain leaves of the Tobacco, and cast them into the fire, and then received the smoke, which they thus produced, in their mouths, in consequence of which they fell down upon the ground; and that after having remained for some time in a stupor, they recovered, and delivered the answers which they pretended to have received, during their supposed intercourse with the world of spirits.

The sedative powers of the *Lactuca Sativa*, or Lettuce,‡ were known also in the earliest times; among the fables of antiquity, we read that after the death of Adonis, Venus threw herself on a bed of lettuces to lull her grief, and repress her desires. The sea onion or *Squill*, was administered in cases of dropsy by the Egyptians, under the mystic title of the *Eye of Typhon*. The practices of incision and scarification were employed in the camp of the Greeks before Troy, and the application of spirit to wounds was also understood, for we find the experienced Nestor applying a cataplasm, composed of cheese, onion, and meal, mixed up with the wine of Pramnos, to the wounds of Machaon.‖

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* Odyss Δ.

† Hence, the Tincture of Opium has been called *Thebaic* Tincture.

‡ Allusions to this plant frequently occur in the medical writings of antiquity; we are told that Galen, in the decline of life, suffered much from morbid vigilance, until he had recourse to eating a lettuce every evening, which cured him.

‖ Iliad Δ.

The revolutions and vicissitudes which remedies have undergone, in medical as well as popular opinion, from the ignorance of some ages, the learning of others, the superstitions of the weak, and the designs of the crafty, afford ample subject for philosophical reflection; some of these revolutions I shall proceed to investigate, classing them under the prominent causes which have produced them, viz. Superstition—Credulity—Scepticism—False Theory—Devotion to Authority, and Established Routine—The assigning to Art that which was the effect of unassisted Nature—The assigning to peculiar substances Properties, deduced from Experiments made on inferior Animals—Ambiguity of Nomenclature—The progress of Botanical science—The application and misapplication of Chemical Philosophy—The Influence of Climate and Season on Diseases, as well as on the properties and operations of their Remedies—The ignorant Preparation, or fraudulent Adulteration of Medicines—The unseasonable collection of those remedies which are of vegetable origin; and, The obscurity which has attended the operation of compound Medicines.

SUPERSTITION.

A belief in the interposition of supernatural powers in the direction of earthly events, has prevailed in every age and country, in an inverse ratio with its state of civilization, or in the exact proportion to its want of knowledge. "In the opinion of the ignorant multitude," says Lord Bacon, "witches and impostors have always held a competition with physicians." Galen also complains of this circumstance, and observes, that his patients were more obedient to the oracle in the temple of Esculapius, or to their own dreams, than they were to his prescriptions. The same popular imbecility is evidently allegorized in the mythology of the ancient poets, when they made both ESCULAPIUS and CIRCE the children of APOLLO; in truth, there is an unaccountable propensity in the human mind, unless subjected to a very long course of discipline, to indulge in the belief of what is improbable and supernatural; and this is perhaps more conspicuous with respect to physic than to any other affair of common life, both because the nature of diseases, and the art of curing them are more obscure, and because disease necessarily awakens fear, and fear and ignorance are the natural parents of superstition; every disease, therefore, the origin and cause of which did not immediately strike the senses, has, in all ages been attributed by the ignorant to the wrath of heaven, to the resentment of some invisible demon, or to some malignant aspect of the stars;[*] and hence the introduction of a rabble of superstitious remedies, not a few of which were rather intended as expiations at the shrines of these offended spirits, than as natural agents possessing medicinal powers. The introduction of precious stones into the materia medica, arose from an Arabian superstition of this kind; indeed De Boot, who has written extensively upon the subject, does not pretend to account for the virtues of gems, upon any philosophical principle, but from their being the residence of spirits, and he adds that such substances, from their beauty, splendour, and value, are well adapted as receptacles for *good* spirits![†]

Every substance whose origin is involved in mystery,[‡] has at different times been eagerly applied to the purposes of Medicine: not long since, one of those showers which are now known to consist of the excrement of insects, fell in the north of Italy; the inhabitants regarded it as Manna, or some supernatural panacea, and they swallowed it with such avidity, that it was only by extreme address, that a small quantity was obtained for a chemical examination. A propensity to attribute every ordinary and natural effect to some extraordinary and unnatural cause, is one of the striking peculiarities of medical superstition; it seeks also explanations from the most preposterous agents, when obvious and natural ones are in readiness to solve the problem. Soranus, for instance, who was cotemporary with Galen, and wrote the life of Hippocrates![‖]

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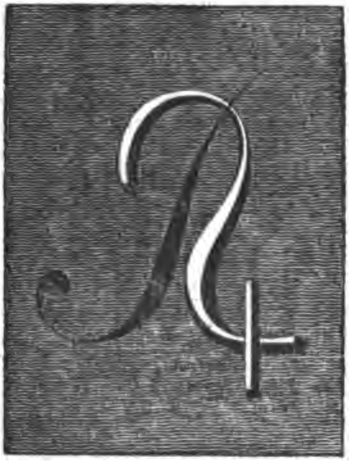
[*] The Plague of London was supposed to have arisen from such a cause, as we learn from the writers of that period. I shall quote a passage from a pamphlet by W. Kemp, M. A dedicated to Charles the Second. "One cause of breeding the pestilence is that corruption of the air, which is occasioned by the influence of the Stars, by the aspects, conjunctions, and oppositions of the Planets, by the eclipses of the Sun and Moon, and by the consequences of Comets. *Astra regunt homines, sed regit astra Deus.*" Hippocrates advises his son Thessalus to study numbers and geometry, (*Epist. ad Thessalum.*) because, says he, the rising and setting of the Stars have a great effect upon Distempers.

[†] The precious Stones were, at first, only used as Amulets, or external charms, but like many other articles of the Materia Medica, they passed, by a mistake in the mode of their application, from the outside to the inside of the body, and they were accordingly powdered and administered as specifics. An analogous case of the perverted administration of a popular remedy is afforded in the history of the Tench; which Sennertus describes as a remedy capable of curing the Jaundice, which he allows is effected "*by secret attraction, and the power of Amulets.*" In the course of time, it became a reputed food in the cure of that disease, and Tench broth was prescribed upon all such occasions.

[‡] Mystery is the very soul of Empiricism; withdraw the veil, and the confidence of the patient instantly languishes; thus Pliny, "*Minus credunt quæ ad suam salutem pertinent, si intelligunt.*"

[‖] It was this historian who said, that Medicine was invented by Apollo, improved by Esculapius, and brought to perfection by the physician of Cos.

tells us that honey proved an easy remedy for the aphthæ of children, but instead of at once referring the fact to the medical qualities of the honey, he very gravely explains it, from its having been taken from bees that hived near the tomb of Hippocrates! And even those salutary virtues which many herbs possess, were, in these times of superstitious delusion, attributed rather to the planet under whose ascendency they were collected, or prepared, than to any natural and intrinsic properties in the plants themselves;* indeed, such was the supposed importance of planetary influence, that it was usual to prefix to receipts a symbol of the planet under whose reign the ingredients were to be collected, and it is not perhaps generally known, that the character which we at this day place at the head of our prescriptions, and which is understood, and supposed to mean *Recipe*, is a relict of the astrological symbol of Jupiter, as may be seen in many of the older works on pharmacy, although it is at present so disguised by the addition of the down stroke, which converts it into the letter ℞, that were it not for its *cloven* foot, we might be led to question the fact of its superstitious origin.



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[*] The Druids of Gaul and Britain, who were both priests and physicians, gathered and cut the *Missletoe* with a golden knife, only when *the Moon was six days old*, and being afterward consecrated by certain forms, it was considered as an antidote to poisons, and a preventive of sterility. *Plinii. Lib.* xvi. c. 44.

The (*Vervain, Verbena Officinalis*,) after libations of honey, was to be gathered at the rising of the dog-star, when neither sun nor moon shone, with the left hand only; when thus prepared, it was said to vanquish fevers, and other distempers, was an antidote to the bite of serpents, and a charm to con-

A knowledge of this ancient and popular belief in sideral influence, will enable us to explain many superstitions in Physic; the custom, for instance, of administering cathartic medicines at stated periods and seasons, originated in an impression of their being more active at particular stages of the moon, or at certain conjunctions of the planets: a remnant of this superstition still exists to a considerable extent in Germany; and the practice of bleeding at 'spring and fall,' so long observed in this country, owed its existence to a similar belief. It was in consequence of the same superstition, that the metals were first distinguished by the names and signs of the planets; and as the latter were supposed to hold dominion over time, so were astrologers led to believe that some, more than others, had an influence on certain days of the week; and moreover, that they could impart to the corresponding metals considerable efficacy upon the particular days which were devoted to them;* from the same belief, some bodies were only prepared on certain days in the year; the celebrated earth of Lemnos, was, as Galen describes, periodically dug with great ceremony, and it continued for many ages to be highly esteemed for its virtues; even at this day, the pit in which the clay is found is annually opened with solemn rites by the priests, on the sixth day of August, six hours after sunrising, when a quantity is taken out, washed, dried, and then sealed with the Grand Signior's seal, and sent to Constantinople. Formerly it was death to open the pit or to seal the earth, on any other day in the year. In the botanical history of the middle ages, as more especially developed in Macer's herbal, there was not a plant of medicinal use, that was not placed under the dominion of some planet, and must neither be gathered nor applied, but with observances that savoured of the most absurd superstition, and which we find were preserved as late as the seventeenth century, by the astrological herbarists, Turner, Culpepper, and Lovel.

It is not the least extraordinary feature in the history of medical superstition, that it should so frequently involve in its trammels, persons who on every other occasion would resent with indignation any attempt to talk them out of their reason, and still more so, to persuade them out of their senses; and

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ciliate friendship. *Plin. Lib.* xxv. c. 9. I shall however hereafter show that the medicinal reputation of this herb derived its origin from a more ancient source even than that of Druidism.

* In later times these heathen symbols were dropped, and others were adopted to propitiate the favour and assistance of heaven; for this purpose, the Alchemists stamped the figure of the cross upon the vessel in which they were to obtain their long sought for prize; a superstitious practice, from which the term *crucible* derives its origin.

yet we have continual proofs of its extensive influence over powerful and cultivated minds; in ancient times we may adduce the wise Cicero, and the no less philosophic Aurelius, while in modern days we need only recall to our recollection the number of persons of superior rank and intelligence, who were actually persuaded to submit to the magnetising operations of Miss Prescott, and some of them were even induced to believe that a beneficial influence had been produced from the spells of this modern Circe.

Lord Bacon, with all his philosophy, betrayed a disposition to believe in the virtues of charms and amulets; and Boyle* seriously recommends the thigh bone of an executed criminal, as a powerful remedy in dysentery. Among the remedies of Sir Theodore Mayerne, known to commentators as the Doctor Caius of Shakspeare, who was physician to three English Sovereigns, and who, by his personal authority, put an end to the distinctions of chemical and galenical practitioners in England, we shall find the secundines of a woman in her first labour with a male child; the bowels of a mole, cut open alive; mummy made of the lungs of a man who had died a violent death; with a variety of remedies, equally absurd, and alike disgusting.

It merits notice, that the medicinal celebrity of a substance has not unfrequently survived the tradition of its superstitious origin, in the same manner that many of our popular customs and rites have continued, through a series of years, to exact a respectful observance, although the circumstances which gave origin to them, have been obscured and lost in the gloom of unrecorded ages. Does not the fond parent still suspend the coral toy around the neck of her infant, without being in the least aware of the superstitious belief† from which the custom originated? while the chorus of *derry down* is re-echoed by those who never heard of the Druids, much less of the choral hymns with which their groves resounded, at the time of their gathering the misletoe; and how many a medical practitioner continues to administer this sacred plant, (*Viscus Quercinus*) for the cure of his epileptic patients, without the least suspicion that it owes its reputation to the same mysterious source of superstition and imposture? Nor is this the only faint vestige of druidism which can be adduced. Mr. Lightfoot states, with much plausibility, that in the highlands of Scotland, evidence still exists in proof of the high esteem in which those ancient Magi held the Quicken-tree, or Mountain Ash, (*Sorbus Aucuparia*) for it is more frequently than any other, found planted in the neighbourhood of druidical circles of stones, and it is a curious fact, that it should be still believed that a small part of this tree, carried about a person, is a charm against all bodily evils,—the dairy-maid drives the cattle with a switch of the *Roan*-tree, for so it is called in the highlands; and in one part of Scotland, the sheep and lambs are, on the first of May, ever made to pass through a hoop of *Roan-wood*.

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* Mr. Boyle was pre-eminently credulous with respect to *specifics*, and contributed very greatly to the encouragement and diffusion of empiricism, by publishing many prescriptions as affording infallible remedies, which were communicated to him by a variety of persons, who either from ignorance or design vouched for their efficacy.

† The Soothsayers attributed many mystic properties to the Coral, and it was believed to be capable of giving protection against the influence of '*Evil Eyes*'; it was even supposed that Coral would drive away Devils, and Evil Spirits; hence arose the custom of wearing amulets composed of it, around the neck, and of making crowns of it. Pliny and Dioscorides are very loud in their praises of the medicinal properties of this substance, and Paracelsus says that it should be worn around the necks of infants as an admirable preservative against fits, sorcery, charms, and even against poison. It is a curious circumstance, that the same superstitious belief should exist among the Negroes of the West Indies, who affirm that the colour of Coral is always affected by the state of health of the wearer, it becoming paler in disease. In Sicily it is also commonly worn as an amulet.

It is also necessary to state, that many of the practices which superstition has at different times suggested, have not been alike absurd; nay, some of them have even possessed, by accident, natural powers of considerable efficacy, whilst others, although ridiculous in themselves, have actually led to results and discoveries of great practical importance. The most remarkable instance of this kind upon record, is that of the *Sympathetic* powder of Sir Kenelm Digby,* Knight of Montpellier. Whenever any wound had been inflicted, this powder was applied to the weapon that had inflicted it, which was, moreover, covered with ointment, and dressed two or three times a day.†

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* See "Sir Kenelm Digby's Discourse upon the cure by Sympathy, pronounced at Montpellier, before an assembly of Nobles and learned men. Translated into English, by R. White, Gentleman, and published in 1658." King James 1st. obtained from Sir Kenelm the discovery of his secret, which he pretended had been taught him by a Carmelite Friar, who had learned it in America or Persia.

The *Sympathetic Powder* was, as we learn from cotemporary physicians, '*calcined green vitriol.*'

† This superstitious practice is repeatedly alluded to by the poets; thus Sir Walter Scott, in the Lay of the Last Minstrel—

"But she has ta'en the broken lance,
"And washed it from the clotted gore,
"And salved the splinter o'er and o'er.
"William of Deloraine, in trance.
"Whene'er she turned it round and round,
"Twisted, as if she galled his wound,

The wound itself, in the mean time, was directed to be brought together, and carefully bound up with clean linen rags, but, ABOVE ALL, TO BE LET ALONE for seven days; at the end of which period the bandages were removed, when the wound was generally found perfectly united. The triumph of the cure was decreed to the mysterious agency of the sympathetic powder which had been so assiduously applied to the weapon, whereas, it is hardly necessary to observe, that the promptness of the cure depended upon the total exclusion of air from the wound, and upon the sanative operations of nature not having received any disturbance from the officious interference of art; the result, beyond all doubt, furnished the first hint, which led surgeons to the improved practice of healing wounds by what is technically called the *first intention*.

The rust of the spear of Telephus, mentioned in Homer as a cure for the wounds which that weapon inflicted, was probably *Verdegris*, and led to the discovery of its use as a surgical application.

Soon after the introduction of Gunpowder, *cold water* was very generally employed throughout Italy, as a dressing to gunshot wounds; not however from any theory connected with the influence of diminished temperature, or of moisture, but from a belief in a supernatural agency imparted to it by certain mysterious and magical ceremonies, which were duly performed immediately previous to its application: the continuance of the practice, however, threw some light upon the surgical treatment of these wounds, and led to a more rational management of them.

"Then to her maidens she did say,
"That he should be whole man and sound."
Canto iii. *St.* xxiii.

Dryden has also introduced the same superstition in his Enchanted Island. Act. v. Scene ii.

Ariel. Anoint the sword which pierced him with this
Weapon salve, and wrap it close from air
Till I have time to visit it again.—

Again, in Scene 4th, Miranda enters with Hippolito's sword, wrapt up:

Hip. O my wounds pain me, (*She unwraps the sword*)
Mir. I am come to ease you.
Hip. Alas, I feel the cold air come to me;
My wound shoots worse than ever.
Mir. Does it still grieve you?
(*She wipes and anoints the sword*)
Hip. Now, methinks, there's something laid just upon it:
Mir. Do you find no ease?
Hip. Yes, yes; upon the sudden all this pain
Is leaving me—Sweet heaven, how I am eased!

The inoculation of the small-pox in India, Turkey, and Wales, observes Sir Gilbert Blane, was practised on a superstitious principle, long before it was introduced as a rational practice into this country. The superstition consisted in buying it—for the efficacy of the operation, in giving safety, was supposed to depend upon a piece of money being left by the person who took it for insertion. The members of the National Vaccine Establishment, during the period I had a seat at the board, received from Mr. Dubois, a Missionary in India, a very interesting account of the services derived from superstitious influence, in propagating the practice of vaccination through that uncivilized part of the globe. It appears from this document, that the greatest obstacle which vaccination encountered, was a belief that the natural small-pox was a dispensation of a mischievous deity among them, whom they called MAH-RY UMMA, or rather, that this disease was an incarnation of the dire goddess herself, into the person who was infected with it; the fear of irritating her, and of exposing themselves to her resentment, necessarily rendered the natives of the East decidedly averse to vaccination, until a superstitious impression, equally powerful, with respect to the new practice, was happily effected; this was no other than a belief, that the goddess MAH-RY UMMA had spontaneously chosen this new and milder mode of manifesting herself to her votaries, and that she might be worshipped with equal respect under this new shape.

HYDROMANCY is another superstition which has incidentally led to the discovery of the medicinal virtues of many mineral waters; a belief in the divining nature of certain springs and fountains, is perhaps the most ancient and universal of all superstitions. The Castalian fountain, and many others among the Grecians, were supposed to be of a prophetic nature; by dipping a fair mirror into a well, the Patræans of Greece received, as they imagined, some notice of ensuing sickness or health; at this very day, the sick and lame are attracted to various hallowed springs; and to this practice, which has been observed for so many ages, and in such different countries, we are no doubt indebted for a knowledge of the sanative powers of many mineral waters. There can be no doubt, moreover, but that, in many cases, by affording encouragement and confidence to a dejected patient, and serenity to his mind, whether by the aid of reason, or the influence of superstition, much benefit may arise; for the salutary and curative efforts of nature, in such a state of mind, must be much more likely to succeed; equally evident is it, that the most powerful effects may be induced by the administration of remedies which, from their disgusting nature, are calculated to excite strong and painful sensations of the mind.[*] Celsus mentions, with confidence, several medicines of this kind for the cure of Epilepsy, as *the warm blood of a recently slain Gladiator*, or a certain portion of *human*, or *horse flesh!* and we find that remedies of this description were actually exhibited, and with success, by Kaw Boerhaave, in the cure of Epileptics in the poor-house at Haerlem. The powerful influence of confidence, in the cure and prevention of disease, was well understood by the sages of antiquity; the Romans, in times of pestilence, elected a dictator with great solemnity, for the sole purpose of driving a nail into the wall of the temple of Jupiter—the effect was generally instantaneous—"*Audacia pro muro est*," and thus imagining that they propitiated an offended god, they in truth only appeased their own fears. Nor are there wanting in modern times, striking examples of the progress of an epidemic disease having been suddenly arrested by some exhilarating impression made upon the mass of the population.

Among the numerous instances which have been cited to show the power of faith over disease, or of the mind over the body, the *cures performed by Royal Touch*,[†] have been generally selected; but it would appear, upon the authority of Wiseman, that the cures which were thus effected, were, in reality, produced by a very different cause; for he states that part of the duty of the Royal Physicians and Sergeant Surgeons, was to select such patients afflicted with scrofula as evinced a tendency towards recovery, and that they took especial care to choose those who approached the age of puberty; in short, those only were produced, whom nature had shown a disposition to cure; and as the touch of the king, like the sympathetic powder of Digby, secured the patient from the mischievous importunities of art, so were the efforts of nature left free and uncontrolled, and the cure of the disease was not retarded, or opposed by the operation of adverse remedies. The wonderful cures of Valentine Greatracks, performed in 1666, which were witnessed by cotemporary prelates, members of parliament, and fellows of the royal society, among whom was the celebrated Mr. Boyle, would probably upon investigation admit of a similar explanation; it deserves, however, to be noticed, that in all records of extraordinary cures performed by mysterious agents, there is a great desire to conceal the remedies and other curative means, which were simultaneously administered with them; thus, Oribasius commends in high terms, a necklace of *Pæony root*, for the cure of Epilepsy; but we learn that he always took care to accompany its use with copious evacuations, although he assigns to them no share of credit in the cure. In later times, we have a good specimen of this species of deception, presented to us in a work on Scrofula by Mr. Morley, written, as we are informed, for the sole purpose of restoring the much injured character and use of the *Vervain;* in which the author directs the root of this plant to be tied with a *yard of white satin ribband*, around the neck, where it is to remain until the patient is cured; but mark—during this interval he calls to his aid the most active medicines in the materia medica!

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[*] At the same time it must be acknowledged that many of these revolting applications have actually produced benefit by a physical operation; we need only mention the nauseous remedies recommended by many writers on Midwifery to expedite delivery, which induced the desired effect by producing nausea, or vomiting. Hartman says (*Opera, Fol. p.* 72) that he has often witnessed among the poor, that difficult labour has been accelerated by a draught of the husband's urine! and, he adds, that horse dung infused in wine is efficacious in expelling the Placenta. Sarah Stone, a midwife who published some cases in 1737, mentions several instances of women in labour, to whom was given the juice of leeks, mixed with their husbands' urine, in order to strengthen the pains. Nauseous remedies have always enjoyed the confidence of the vulgar; this prejudice would seem to be the result of a species of false reasoning, by no means uncommon, that "as every thing medicinal is nauseous, so must every thing that is nauseous be consequently medicinal."

[†] Edward the Confessor was the first English King who *touched* for the Evil, and the foolish superstition has been wisely laid aside, ever since the accession of the house of Hanover.

The advantages which I have stated to have occasionally arisen from superstitious influence, must be understood as being generally accidental; indeed, in the history of superstitious practices, we do not find that their application was exclusively commended in cases likely to be influenced by the powers of faith or of the imagination, but, on the contrary, that they were as frequently directed in affections that were entirely placed beyond the control of the mind. Homer tells us, for instance, that the bleeding of Ulysses was stopped by a charm:* and Cato the censor has favoured us with an incantation for the reduction of a dislocated limb. In certain instances, however, we are certainly bound to admit that the pagan priesthood, with their characteristic cunning, were careful to perform their superstitious incantations, in such cases only as were likely to receive the sanative assistance of Nature, so that they might attribute the fortunate results of her efforts to the potent influence of their own arts. The extraordinary success which is related to have attended various superstitious ceremonials, will thus find a plausible explanation: the miraculous gift attributed by Herodotus to the Priestesses of Helen, is one among many others of this kind that might be adduced; the Grecian historian relates, that when the heads of ugly infants were adjusted on the altar of this temple, the individuals so treated acquired comeliness and even beauty as they advanced in growth: but is not such a change the ordinary and unassisted result of natural developement? Those large and prominent outlines which impart an unpleasing physiognomy to the infant, when proportioned and matured by growth, assume features of intelligence in the adult face.

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* This superstitious notion is not confined to the ancients, but is even cherished at this day, in some of the more remote districts of the kingdom; and we find frequent allusions to it in the popular poetryof the seventeenth century.

"Tom Pots was but a serving man,
But yet he was a doctor good;
He bound his 'kerchief on the wound,
And *with some kind words* he staunched the blood."

Sir Walter Scott in his "Lay of the last Minstrel"—

I shall conclude these observations, by remarking that, in the history of religious ceremonials, we sometimes discover that they were intended to preserve useful customs or to conceal important truths; which, had they not been thus embalmed by superstition, could never have been perpetuated for the use and advantage of posterity. I shall illustrate this assertion by one or two examples. Whenever the ancients proposed to build a town, or to pitch a camp, a sacrifice was offered to the gods, and the Soothsayer declared, *from the appearance of the entrails*, whether they were propitious or not to the design. What was this but a physiological inquiry into the salubrity of the situation, and the purity of the waters that supplied it? for we well know that in unwholesome districts, especially when swampy, the cattle will uniformly present an appearance of disease in the viscera, which an experienced eye can readily detect; and when we reflect upon the age and climate in which these ceremonies were performed, we cannot but believe that

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"She drew the splinter from the wound,
And with a *charm* she staunch'd the blood."

The reader will also find the enumeration of several charms for this purpose, in Reginald Scot's Discoverie of Witchcraft, p. 278.

We learn also from Sennertus, that the older Surgeons had recourse to prayers and magic for the extraction of foreign bodies from wounds; a very interesting summary of their superstitions, and peculiar notions concerning wounds, will be found in this author, under the head, "De Rebus alienis e vulnere eximendis." Lib. v. Pars. iv. Practicæ Medicinæ.

their introduction was suggested by principles of wise and useful policy. In the same manner, *Bathing*, which at one period of the world, was essentially necessary to prevent the diffusion of Leprosy, and other infectious diseases, was wisely converted into an act of religion, and the priests persuaded the people that they could only obtain absolution by washing away their sins by frequent ablutions; since the use of linen shirts has become general, and every one has provided for the cleanliness of his own person, the frequent bath ceases to be so essential, and therefore no evil has arisen from the change of religious belief respecting its connexion with the welfare and purity of the soul. These instances are sufficient to show the justness of my position; if time and space would allow, many others of a striking and interesting character might be adduced.

CREDULITY.

Although it is nearly allied to Superstition, yet it differs very widely from it. Credulity is an unbounded belief in what is possible, although destitute of proof, and perhaps of probability; but Superstition is a belief in what is wholly repugnant to the laws of the physical and moral world. Thus, if we believe that an inert plant possesses any remedial power, we are *credulous;* but if we were to fancy that, by carrying it about with us, we should become invulnerable, we should in that case be *superstitious.* Credulity is a far greater source of error than Superstition; for the latter must be always more limited in its influence, and can exist only, to any considerable extent, in the most ignorant portion of society; whereas the former diffuses itself through the minds of all classes, by which the rank and dignity of science are degraded, its valuable labours confounded with the vain pretensions of empiricism, and ignorance is enabled to claim for itself the prescriptive right of delivering oracles, amidst all the triumphs of truth, and the progress of philosophy. This is very lamentable; and yet, if it were even possible to remove the film that thus obscures the public discernment, I question whether the adoption of such a plan would not be outvoted by the majority of our own profession. In Chili, says Zimmerman, the physicians blow around the beds of their patients to drive away diseases, and as the people in that country believe that physic consists wholly in this wind, their doctors would take it very ill of any person who should attempt to make the method of cure more difficult—*they think they know enough, when they know how to blow.*

But this mental imbecility is not characteristic of any age or country. England has, indeed, by a late continental writer,* been accused of possessing a larger share of credulity than its neighbours, and it has been emphatically called "*The Paradise of Quacks*," but with as little truth as candour. If we refer to the Works of Ætius, written more than 1300 years ago, we shall discover the existence of a similar infirmity with regard to physic. This author has collected a multitude of receipts, particularly those that had been celebrated, or used as *Nostrums*, many of which he mentions with no other view than to expose their folly, and to inform us at what an extravagant price they were purchased. We accordingly learn from him that the collyrium of Danaus was sold at Constantinople for 120 numismata, and the cholical antidote of Nicostratus for two talents; in short, we shall find an unbounded credulity with respect to the powers of inert medicines, from the elixir and *alkahest* of Paracelsus and Van-Helmont, to the tar water of bishop Berkeley, the metallic tractors of Perkins, the animal magnetism of Miss Prescott, and may I not add, with equal justice, to the nitro-muriatic acid bath of Dr. Scott? The description of Thessalus, the Roman empiric in the reign of Nero, as drawn by Galen, applies with equal fidelity and force to the medical Charlatan of the present day; and, if we examine the writings of Scribonius Largus, we shall obtain ample evidence that the same ungenerous selfishness† of keeping medicines secret, prevailed in ancient no less than in modern times; while we have only to read the sacred orations of Aristides to be satisfied, that the flagrant conduct of the Asclepiades, from which he so severely suffered,‡ was the very prototype of the cruel and remorseless frauds, so wickedly practised by the unprincipled Quack Doctors and advertising "*Medical boards*" of our own times: and I challenge the apologist of ancient purity, to produce a more glaring instance of empirical effrontery and success, in the annals of the 19th century, than that of the sacred impostor described in the Alexander of Lucian, who established himself in the deserted temple of Esculapius, and entrapped in his snares some of the most eminent of the Roman senators.

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* See a Tour through England, by Dr. Nemnich of Hamburgh.

† *Nostrum*, (our own.) This word, as its original meaning implies, is very significant of this characteristic attribute of quackery. See the note under the article "Liquor Opii Sedativus."

‡ Aristides was the dupe and victim of the Asclepiades for ten successive years; he was alternately purged, vomited, and blistered; made to walk barefooted, under a burning sun in summer, and in winter he was doomed to seek for the return of health, by bathing his feeble and emaciated body in the river. All this severity, he was made to believe, was exercised towards him by the express directions of Esculapius himself, with whom he was persuaded to fancy that he conversed in his dreams, and frequently beheld in nocturnal visions. Upon one occasion, the god, fatigued with the importunities of his votary, ordered him to lose 120 lbs. of blood; the unhappy man not having so much in his body, *wisely* took the liberty of interpreting the oracle in his own way, and parted with no more than he could conveniently spare.

SCEPTICISM.

Credulity has been justly defined, *Belief without Reason.* Scepticism is its opposite, *Reason without Belief*, and is the natural and invariable consequence of credulity: for it may be generally observed, that men who believe without reason, are succeeded by others whom no reasoning can convince; a fact which has occasioned many extraordinary and violent revolutions in the *Materia Medica*, and a knowledge of it will enable us to explain the otherwise unaccountable rise and fall of many useless, as well as important articles. It will also suggest to the reflecting practitioner, a caution of great moment, to avoid the dangerous fault imputed by Galen to Dioscorides, of ascribing too many and too great virtues to one and the same medicine. By bestowing unworthy and extravagant praise upon a remedy, we in reality do but detract from its reputation, and run the risk of banishing it from practice; for when the sober practitioner discovers by experience that a medicine falls so far short of the efficacy ascribed to it, he abandons its use in disgust, and is even unwilling to concede to it that degree of merit, to which in truth and justice it may be entitled; the inflated eulogiums bestowed upon the operation of *digitalis* in pulmonary diseases, excited, for some time, a very unfair impression against its use; and the injudicious manner in which the antisyphilitic powers of *Nitric Acid* have been aggrandized, had very nearly exploded a valuable auxiliary from modern practice. It is well known with what avidity the public embraced the expectations given by Stöerck of Vienna in 1760, with respect to the efficacy of *Hemlock;* every body, says Dr. Fothergill, made the extract, and every body prescribed it, but finding that it would not perform the wonders ascribed to it, and that a multitude of discordant diseases refused to yield, as it was asserted they would, to its narcotic powers, practitioners fell into the opposite extreme of absurdity, and declaring that it could do nothing at all, dismissed it at once as inert and useless. Can we not then predict the fate of the *Cubebs*, which has been lately restored to notice, with such extravagant praise, and unqualified approbation? May the sanguine advocates for the virtues of the Colchicum derive a useful lesson of practical caution from these precepts, it would be a matter of deep regret that a remedy which, under skilful management, certainly possesses considerable virtue, should again fall into obscurity and neglect from the disgust excited by the extravagant zeal of its supporters.

There are, moreover, those who cherish a spirit of scepticism, from an idea that it denotes the exercise of a superior intellect; it must be admitted, that at that period in the history of Europe, when reason first began to throw off the yoke of authority, it required superiority of understanding as well as intrepidity of conduct, to resist the powers of that superstition which had so long held it in captivity; but in the present age, observes Mr. Dugald Stewart, "*unlimited scepticism is as much the child of imbecility as implicit credulity*." "He who at the end of the eighteenth century," says Rousseau, "has brought himself to abandon all his early principles, without discrimination, would probably have been a bigot in the days of the league."

FALSE THEORIES, AND ABSURD CONCEITS.

He who is governed by preconceived opinions, may be compared to a spectator who views the surrounding objects through coloured glasses, each assuming a tinge similar to that of the glass employed; thus have crowds of inert and insignificant drugs been indebted to an ephemeral popularity, from the prevalence of a false theory; the celebrated hypothesis of Galen respecting the virtues and operation of medicines, may serve as an example; it is a web of philosophical fiction, which was never surpassed in absurdity. He conceives that the properties of all medicines are derived from what he calls their elementary or *cardinal* qualities, HEAT, COLD, MOISTURE, and DRYNESS. Each of which qualities is again subdivided into four degrees, and a plant or medicine, according to his notion, is cold, or hot, in the first, second, third, or fourth gradation; if the disease be hot or cold in any of these four stages, a medicine possessed of a contrary quality, and in the same proportionate degree of elementary heat or cold, must be prescribed. Saltness, bitterness, and acridness depend, in his idea, upon the relative degrees of heat and dryness in different bodies. It will be easily seen how a belief in such an hypothesis must have multiplied the list of inert articles in the materia medica, and have corrupted the practice of physic. The variety of seeds derived its origin from this source, and until lately, medical writers, in the true jargon of Galen, spoke of the *four* greater and lesser *hot* and *cold* seeds; and in the London Dispensatory of 1721, we find the powders of *hot* and *cold* precious stones, and those of the *hot* and *cold* compound powders of pearl. Several of the ancient combinations of opium with various aromatics are also indebted to Galen for their origin, and to the blind influence of his authority for their existence and lasting reputation. Galen asserted that opium was *cold in the fourth degree*, and must therefore require some corresponding hot medicine to moderate its frigidity.*

THE METHODIC SECT, which was founded by the Roman physician Themison,† a disciple of Asclepiades, as they conceived all diseases to depend upon *overbracing*, or *relaxation*, so did they class all medicines under the head of *relaxing* and *bracing* remedies; and although this theory has been long since banished from the schools, yet it continues at this day to exert a secret influence on medical practice, and to preserve from neglect some unimportant medicines. The general belief in the relaxing effect of the *warm*, and the equally strengthening influence of the *cold* bath, may be traced to conclusions deduced from the operation of hot and cold water upon parchment and other inert bodies.‡

THE STAHLIANS, under the impression of their ideal system, introduced *Archaal* remedies, and many of a superstitious and inert kind; whilst, as they on all occasions trusted to the constant attention and wisdom of nature, so have they zealously opposed the use of some of the most efficacious instruments of art, as the Peruvian *bark*, and few physicians were so reserved in the use of general remedies, as bleeding, vomiting, and the like; their practice was therefore imbecile, and it has been aptly enough denominated, "*a meditation upon death.*" They were however vigilant in observation and acute in discernment, and we are indebted to them for some faithful and minute descriptions.

THE MECHANICAL THEORY, which recognised "*lentor and morbid viscidity of the blood*," as the principal cause of all diseases, introduced attenuant and diluent medicines, or substances endued with some mechanical force; thus Fourcroy explained the operation of mercury by its specific gravity,* and the advocates of this doctrine favoured the general introduction of the preparations of iron, especially in scirrhus of the spleen or liver, upon the same hypothetical principle; for, say they, whatever is most forcible in removing the obstruction, must be the most proper instrument of cure; such is *Steel*, which, besides the attenuating power with which it is furnished, has still a greater force in this case from the *gravity* of its particles, which, being seven times specifically heavier than any vegetable, acts in proportion with a stronger impulse, and therefore is a more powerful deobstruent. This may be taken as a specimen of the style in which these mechanical physicians reasoned and practised.

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* This theory is still cherished in the preservation of the formula for *Pilulæ Opiatæ*, in the Edinburgh Pharmacopœia.

† The practice of this Physician does not appear to have been very successful, if we may credit Juvenal.—

"Quot Themison ægros autumno occiderit uno."

‡ See "An Experimental Inquiry into the effects of Tonics, and other Medicines, on the cohesion of the Animal fibre." By Dr. Crawford.

THE CHEMISTS, as they acknowledged no source of disease, but the presence of some hostile acid or alkali, or some deranged condition in the chemical composition of the fluid or solid parts, so they conceived all remedies must act by producing chemical changes in the body. We find Tournefort busily engaged in testing every vegetable juice, in order to discover in it some traces of an acid or alkaline ingredient, which might confer upon it medicinal activity. The fatal errors into which such an hypothesis was liable to betray the practitioner, receive an awful illustration in the history of the memorable fever that raged at Leyden in the year 1699, and which consigned two-thirds of the population of that city to an untimely grave; an event which, in a great measure, depended upon the Professor Sylvius de la Boe, who having just embraced the chemical doctrines of Van Helmont, assigned the origin of the distemper to a prevailing acid, and declared that its cure could alone be effected by the copious administration of absorbent and testaceous medicines; an extravagance into which Van Helmont, himself, would hardly have been betrayed:—but thus it is in Philosophy, as in Politics, that the partisans of a popular leader are always more sanguine, and less judicious, than their master; they are not only ready to delude the world, but most anxious to deceive themselves, and while they warmly defend their favourite system from the attacks of those that may assail it, they willingly close their own eyes, and conceal from themselves the different points that are untenable; or, to borrow the figurative language of a French writer, they are like the pious children of Noah, who went backwards, that they might not see the nakedness which they approached for the purpose of covering.

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* Van Swieten, in his Commmentaries on the Venereal Disease, has an aphorism founded on the same hypothesis, "Render the blood and lymph more fluid, and you will have destroyed the virus." Sect. 1477.

In the first volume of the Transactions of the Royal College of Physicians, there is a paper to the same effect, entitled, "On the Operation of Mercury, in different diseases and constitutions, by Edward Barry, M.D. F.R.S." Read at the College, July 13, 1767.

Unlike the mechanical physicians, the chemists explain the beneficial operation of iron by supposing that it increases the proportion of red globules in the blood, on the erroneous* hypothesis that iron constitutes the principal element of these bodies. Thus has iron, from its acknowledged powers, been enlisted into the service of every prevailing hypothesis; and it is not a little singular, as a late writer has justly observed, that theories, however different, and even adverse, do nevertheless often coincide in matters of practice, as well with each other as with long established empirical usages, each bending as it were, and conforming in order to do homage to truth and experience. And yet iron, whose medicinal virtues have been so generally allowed, has not escaped those vicissitudes in reputation which almost every valuable remedy has been doomed to suffer: at one period the ancients imagined that wounds inflicted by iron instruments, were never disposed to heal, for which reason Porsenna, after the expulsion of the Tarquins, actually stipulated with the Romans that they should not use iron, except in agriculture; and Avicenna was so alarmed at the idea of its internal use as a remedy, when given in substance, that he seriously advised the exhibition of a magnet† after it to prevent any direful consequences. The fame even of Peruvian bark has been occasionally obscured by the clouds of false theory; some condemned its use altogether, "because it did not evacuate the morbific matter," others, "because it bred obstructions in the viscera," others again, "because it only bound up the spirits, and stopped the paroxysms for a time, and favoured the translation of the peccant matter into the more noble parts."

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* The animal nature of the colouring matter of the blood was first pointed out by Dr. Wells, but Fourcroy and Vauquelin considered it to be owing to *subphosphate of iron*. Mr. Brande, in 1812, demonstrated the fallacy of this opinion, and proved, by satisfactory experiments, its title to be considered as a peculiar animal principle; the subsequent experiments of M. Vauquelin have confirmed Mr. Brande's results.

† The Magnet, or Loadstone, in powder, entered also as an ingredient in several plasters to draw bullets, and heads of arrows, out of the body, as in the "*Emplastrum Divinum Nicolai*," the "*Emplastrum Nigrum*" of Augsburg, the "*Opodeldock*" and "*Attractivum*," of Paracelsus, with several other preparations, to be found in the Dispensatory of Wecker, and in the practice of Sennertus.

Thus we learn from Morton,* that Oliver Cromwell fell a victim to an intermittent fever, because the Physicians were too timid to make a trial of the bark. It was sold first by the Jesuits for its weight in silver;† and Condamine relates that in 1690, about thirty years afterward, several thousand pounds of it lay at Piura and Payta for want of a purchaser.

Nor has Sugar escaped the venom of fanciful hypothesis. Dr. Willis raised a popular outcry against its domestic use, declaring, that "it contained within its particles a secret acid,—a dangerous sharpness,—which caused scurvies, consumptions, and other dreadful diseases."

Although I profess to offer merely a few illustrations of those doctrines, whose perverted applications have influenced the history of the Materia Medica, I cannot pass over in silence that of John Brown, "the child of genius and misfortune." As he generalized diseases, and brought all within the compass of two grand classes, those of *increased* and *diminished* excitement, so did he abridge our remedies, maintaining that every agent which could operate on the human body was a *Stimulant*, having an identity of action, and differing only in the degree of its force; so that, according to his views, the lancet and the brandy-bottle were but the opposite extremes of one and the same class: the mischievous tendency of such a doctrine is too obvious to require a comment.

But the most absurd and preposterous hypothesis that has disgraced the annals of medicine, and bestowed medicinal reputation upon substances of no intrinsic worth, is that of the DOCTRINE OF SIGNATURES, as it has been called, which is no less than a belief that *every natural substance which possesses any medicinal virtue, indicates by an obvious and well-marked external character, the disease for which it is a remedy, or the object for which it should be employed!*‡ This extraordinary monster of the fancy has been principally adopted and cherished by Paracelsus, Baptista Porta, and Crollius, although traces of its existence may be certainly discovered in more ancient authors;

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* PYRETOLOGIA, p. 17, A. D. 1692.

† Sturmius in his "*Febrifugi Peruviani Vindiciæ*," published in 1658, observes that he saw twenty doses of the powder sold at Brussels for sixty florins, in order to be sent to Paris, and that he would willingly have been a purchaser of some doses, even at that price; but the Apothecary was unable to supply him; an anecdote which not only shows the reputation of the bark, but the honesty of the vender.

† This produced a pamphlet from Dr. Slare, entitled "A Vindication of Sugars against the Charge of Dr. Willis and others: *dedicated to the Ladies*." 1715.

‡ This conceit did not escape the notice of the metaphysical poets of the seventh century; Cowley frequently availed himself of it to embellish his verse.

the supposed virtues of the *Lapis Ætites*, or *Eagle stone*,* described by Dioscorides, Ætius, and Pliny, who assert, that if tied to the arm, it will prevent abortion, and if fixed to the thigh, forward delivery, were, as we learn from ancient authority, solely suggested by the manner in which the nodule contained within the stone moves and rattles whenever it is shaken. "*Ætites lapis agitatus, sonitum edit, velut ex altero lapide prægnans.*" The conceit, however, did not assume the importance of a theory until the end of the fourteenth century, at which period we find several authors engaged in the support of its truth, and it will not be unamusing to offer a specimen of their sophistry; they affirm, that since man is the lord of the creation, all other creatures are designed for his use, and *therefore*, that their beneficial qualities and excellencies must be expressed by such characters as can be seen and understood by every one; and as man discovers his reason by speech, and brutes their sensations by various sounds, motions, and gestures, so the vast variety and diversity of figures, colours, and consistencies, observable in inanimate creatures, is certainly designed for some wise purpose. It *must be*, in order to manifest these peculiar qualities and excellencies, which could not be so effectually done in any other way, not even by speech, since no language is universal. Thus, the lungs of a fox must be a specific for asthma, *because* that animal is remarkable for its strong powers of respiration. *Turmeric* has a brilliant yellow colour, which indicates that it has the power of curing the jaundice; for the same reason, *Poppies* must relieve diseases of the head; *Agaricus* those of the bladder; *Cassia fistula* the affections of the intestines, and *Aristolochia* the disorders of the uterus: the polished surface and stony hardness which so eminently characterize the seeds of the *Lithospermum Officinale* (Common Gromwell) were deemed a certain indication of their efficacy in calculous and gravelly disorders; for a similar reason the roots of the *Saxifraga Granulata* (White Saxifrage) gained reputation in the cure of the same disease; and the *Euphrasia* (Eye-bright) acquired fame as an application in complaints of the eye, because it exhibits a black spot in its corolla resembling the pupil.

The blood-stone, the *Heliotropium* of the ancients, from the occasional small specks or points of a blood red colour exhibited on its green surface, is even at this day employed in many parts of England and Scotland, to stop a bleeding from the nose; and nettle tea continues a popular remedy for the cure of *Urticaria*. It is also asserted that some substances bear the SIGNATURES of the humours, as the petals of the red rose that of the blood, and the roots of rhubarb, and the flowers of saffron, that of the bile.*

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* This mineral derives its name from the ancient belief that it was found in the nests of the eagle. It is a variety of iron ore, which is commonly met with in the argillaceous mines of this country.

I apprehend that John of Gaddesden, in the fourteenth century, celebrated by Chaucer, must have been directed by some remote analogy of this kind, when he ordered the son of Edward the First, who was dangerously ill with the small-pox, to be wrapped in scarlet cloth, as well as all those who attended upon him, or came into his presence, and even the bed and room in which he was laid were covered with the same substance, and so completely did it answer, say the credulous historians of that day, that the Prince was cured without having so much as a single mark left upon him.

In enumerating the conceits of Physic, as relating to the Materia Medica, we must not pass over the idea so prevalent at one period, that *All poisonous substances possess a powerful and mutual elective attraction for each other;* and that consequently, if a substance of this kind were suspended around the neck, it would, by intercepting and absorbing every noxious particle, preserve the body from the virulence of contagious matter. Angelus Sala, accordingly, gives us a formula for what he terms his *Magnes Arsenicalis*, which he asserts will not only defend the body from the influence of poison, but will, from its powers of attraction, draw out the venom from an infected person. In the celebrated plague of London, we are informed that amulets of arsenic were upon this principle suspended over the region of the heart, as a preservative against infection.

DEVOTION TO AUTHORITY, AND ESTABLISHED ROUTINE.

This has always been the means of opposing the progress of reason—the advancement of natural truths—and the prosecution of new discoveries; whilst, with effects no less baneful, has it perpetuated many of the stupendous errors, which have been already enumerated, as well as others no less weighty, and which are reserved for future discussion.

To give general currency to an hypothetical opinion, or medicinal reputation to an inert substance, requires only the talismanic aid of a few great names; when once established upon such a basis, ingenuity, argument, and even experiment, may open their ineffectual batteries. The laconic sentiment of the Roman Satirist is ever opposed to our remonstrance—"Marcus dixit?—ita est."

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* For a further account of this conceit, see Crollius, in a work appended to his "BASILICA CHEMICA," entitled, "De Signaturis internis rerum, seu de vera et viva Anatomia majoris et minoris mundi."

> "Did Marcus say 'twas fact? then fact it is,
> No proof so valid as a word of his."

A physician cannot err, in the opinion of the public, if he implicitly obeys the dogmas of authority; in the most barbarous ages of ancient Egypt, he was punished or rewarded according to the extent of his success, but to escape the former, it was only necessary to show that an orthodox plan of cure had been followed, such as was prescribed in the acknowledged writings of Hermes. It is an instinct in our nature to follow the track pointed out by a few leaders; we are gregarious animals, in a moral as well as physical sense, and we are addicted to routine, because it is always easier to follow the opinions of others, than to reason and judge for ourselves. "The mass of mankind," as Dr. Paley observes, "act more from habit than reflection." What, but such a temper could have upheld the preposterous system of Galen for more than thirteen centuries? and have enabled it to give universal laws in medicine to Europe—Africa—and part of Asia? What, but authority, could have inspired a general belief, that the sooty washings of rosin* would act as a universal remedy? What, but a blind devotion to authority, or an insuperable attachment to established custom and routine, could have so long preserved from oblivion the absurd medicines which abound in our earlier dispensatories? for example, the *Decoctum ad Ictericos*," of the Edinburgh College, which never had any other foundation than the doctrine of signatures in favour of the *Curcuma* and *Chelidonium Majus*;† and it is only within a few years, that the *The-*

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* This practice of Bishop Berkeley has been ridiculed with great point and effect, in a pamphlet entitled, "A Cure for the Epidemical Madness of drinking Tar Water," by Mr. Reeve; in which, addressing the Bishop, he says, "thus, in your younger days, my Lord, you made the surprising discovery of the unreality of matter, and now in your riper age, you have undertaken to prove the reality of a universal remedy; an attempt to talk men out of their reason, did of right belong to that author who had first tried to persuade them out of their senses." Tar water was also at one period considered to possess very considerable efficacy in Syphilis.

† The Euphrasia Officinalis, or Eye-bright, which is indebted for its celebrity to the doctrine of Signatures, as before stated, is actually employed at this time in cases of dimness of sight. See a Paper upon the efficacy of this plant by Dr. Jackson, in the London Medical and Physical Journal. Vol. 23. p. 104.

riaca Andromachi, in its ancient absurd form, has been dismissed from the British Pharmacopœia. The CODEX-MEDICAMENTARIUS of Paris, recently edited, still cherishes this many-headed* monster of pharmacy, in all its pristine deformity, under the appropriate title of "*Electuarium Opiatum Polupharmacum.*"

It is, however, evidently indebted for this unexpected rescue from oblivion, to a cause very remote from that which may be at first imagined; not from any belief in its powers, or reliance upon its efficacy, but from a disinclination to oppose the torrent of popular prejudice, and to reject what has been established by authority and sanctioned by time. For the same reason, and in violation of their better judgment, the editors have retained the absurd formula of Diest for the preparation of an extract of opium; which, after directing various successive operations, concludes by ordering the decoction to be boiled incessantly for six months, supplying the waste of water at intervals! Many of the compound formulæ in this new CODEX, it is frankly allowed, possess an unnecessary and unmeaning, if not an injurious complexity; and yet such force has habit, and so paramount are the *verba magistri*, that the editors rest satisfied in distinguishing the more important ingredients by printing them in *Italics*, leaving the rest to be supplied at the whim and caprice of the dispenser, and thus are the grand objects and use of a national Pharmacopœia defeated, which should above all things ensure uniformity in the strength and composition of its officinal preparations.

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* This preparation consists of 72 ingredients, which are arranged under 13 heads—viz. ACRIA, of which there are 5 species. AMARA, of which there are 8. STYPTICA vulgo ASTRINGENTIA, 5 in number. AROMATICA EXOTICA, 14. AROMATICA INDIGENA, 10. AROMATICA EX UMBELLIFERIS, 7. RESINOSA ET BALSAMA, 8. GRAVE-OLENTIA, 6. VIROSA, "seu quæ Narcosin inducunt," under which head there is but one species, viz. Opium. TERREA INSIPIDA ET INERTIA; this comprises only the *Lemnian Earth*. GUMMOSA, AMYLACEA, &c. 4 species. DULCIA, *liquorice and honey*. VINUM, *Spanish*.

Upon no principle of combination can this heterogeneous farrago be vindicated. It has, however, enjoyed the confidence of physicians for many ages, and is therefore entitled to some notice. It was supposed to have been invented by Mithridates, the famous king of Pontus, the receipt for which was said to have been found among his papers after his defeat by Pompey, at which time it was published in Rome under his title of "Antidotum Mithridatium," but the probability is, says Dr. Heberden, that Mithridates was as much a stranger to his own antidote as several eminent physicians have since been to the medicines that are daily advertised under their names. It was asserted, that whoever took a proper quantity in the morning was ensured from poison during the whole of that day, (Galen de Antidot. Lib. 1.) and it was further stated, that Mithridates himself was so fortified against all baneful drugs, that none would produce any effect when he attempted to destroy himself. (Celsus, lib. 5. c. 23.) In the course of ages, it has undergone numerous alterations. According to Celsus, who first described it, it contained only 35 simples; Andromachus, Physician to Nero, added vipers, and increased the number of ingredients to 75; and when thus reformed, he called it γαλήνη—but in Trajan's time it obtained the name of *Theriaca*, either from the vipers in it, or from its supposed effects in curing the bites of venomous animals. Damocrates gave a receipt for it in Greek Iambics, which has been preserved by Galen. It appears then that its composition has hardly remained the same for a hundred years; it is, says Dr. Heberden, a farrago, that has no better title to the name of Mithridates than, as it so well resembles, the numerous undisciplined forces of a barbarous king, made up of a dissonant crowd collected from different countries, mighty in appearance, but in reality, an ineffective multitude, that only hinder each other. ANTIΘΗΡΙΑΚΑ, by W. Heberden, M.D. 1745.

The same devotion to authority which induces us to retain an accustomed remedy for pertinacity, will always oppose the introduction of a novel practice with asperity, unless indeed it be supported by authority of still greater weight and consideration. The history of various articles of diet and medicine will prove in a striking manner, how greatly their reputation and fate have depended upon authority. It was not until many years after *Ipecacuan* had been imported into Europe, that Helvetius, under the patronage of Louis XIV., succeeded in introducing it into practice: and to the eulogy of Katharine, queen of Charles II., we are indebted for the general introduction of Tea into England.

That most extraordinary plant,* *Tobacco*, notwithstanding its

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* Hernandes de Toledo sent this plant into Spain and Portugal in 1559, when Jean Nicot was Ambassador at the Court of Lisbon from Francis II, and he transmitted, or carried either the seed, or the plant, to Catherine de Medicis: it was then considered as one of the wonders of the new world, and was supposed to possess very extraordinary virtues: this seems to be the first authentic record of the introduction of this plant into Europe. In 1589 the Cardinal Santa Croce, returning from his nunciature in Spain and Portugal to Italy, carried thither with him Tobacco, and we may form some notion of the enthusiasm with which its introduction was hailed, from a perusal of the poetry which the subject inspired; the poets compare the exploit of the holy Cardinal with that of his progenitor who brought home the wood of the true cross.

———— "Herb of immortal fame!
Which hither first with Santa Croce came,
When he, his time of nunciature expired,
Back from the Court of Portugal retired;
Even as his predecessors, great and good,
Brought home the cross." ————

In England, it is said that the smoking Tobacco was first introduced by Sir Walter Raleigh on his return from America. James the First wrote a philippic against it, entitled a "COUNTERBLASTE TO TOBACCO," in which the royal author, with more prejudice than dignity, informs his loving subjects that "it is a custome loathsome to the eye, hatefull to the nose, harmefull to the braine, dangerous to the lungs; and in the blacke stinking fume thereof, neerest resembling the horrible Stigian smoake of the pit that is bottomlesse." In 1604 this monarch endeavoured by means of heavy imposts to abolish its use in this country, and in 1619 he commanded that no planter in Virginia should cultivate more than 100 lbs. It must be confessed that some legislative enactment was necessary at this period for restricting the custom of smoking Tobacco, for we powers of fascination, has suffered romantic vicissitudes in its fame and character; it has been successively opposed and commended by physicians—condemned and eulogized by priests and kings—and proscribed, and protected by governments; whilst at length this once insignificant production of a little island, or an obscure district, has succeeded in diffusing itself through every climate, and in subjecting the inhabitants of every country to its dominion. The Arab cultivates it in the burning desert—the Laplander and Esquimaux risk their lives to procure a refreshment so delicious in their wintry solitude —the Seaman, grant him but this luxury, and he will endure with cheerfulness every other privation, and defy the fury of the raging elements; and in the higher walks of civilized society, at the shrine of fashion, in the palace, and in the cottage, the fascinating influence of this singular plant commands an equal tribute of devotion and attachment. The history of the Potato is perhaps not less extraordinary, and is strikingly illustrative of the omnipotent influence of authority; the introduction of this valuable plant received, for more than two centuries, an unexampled opposition from vulgar prejudice, which all the philosophy of the age was unable to dissipate, until Louis XV. wore a bunch of the flowers of the potato in the midst of his court, on a day of festivity; the people then for the first time obsequiously acknowledged its utility, and began to express their astonishment at the apathy which had so long prevailed with regard to its general cultivation; that which authority thus established, time and experience have

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are told in the Counterblaste, that many persons expended as much as five hundred pounds per annum in the purchase of this article, which in those days was an enormous amount.

In 1624 Pope Urban the VIIIth published a decree of excommunication against all who took snuff in the church. Ten years after this, smoking was forbidden in Russia, under the pain of having the nose cut off; in 1653 the Council of the Canton of Appenzel cited smokers before them, whom they punished, and they ordered all inkeepers to inform against such as were found smoking in their houses. The police regulations of Bern made in 1661 was divided according to the Ten Commandments, in which the prohibition of smoking stands immediately beneath the command against adultery; this prohibition was renewed in 1675, and the Tribunal instituted to put it into execution—viz.; CHAMBRE AU TABAC—continued to the middle of the 18th century. Pope Innocent the XIIth, in 1690 excommunicated all those who were found taking snuff or tobacco in the church of St. Peter at Rome; even so late as 1719 the Senate of Strasburgh prohibited the cultivation of Tobacco from an apprehension that it would diminish the growth of corn; Amurath the IVth published an edict which made smoking Tobacco a capital offence; this was founded on an opinion that it rendered the people infertile. Those who are curious to learn more of the history of this extraordinary plant I beg to refer to a very interesting paper by "Medicus," in the 24th volume of the London Medical and Physical Journal, p. 445.

fully ratified, and scientific research has extended the numerous resources which this plant is so wonderfully calculated to furnish; thus, its stalk, considered as a textile plant, produces in Austria a cottony flax—in Sweden sugar is extracted from its root—by combustion, its different parts yield a very considerable quantity of potass—its apples, when ripe, ferment and yield vinegar by exposure, or spirit by distillation—its tubercles made into a pulp, are a substitute for soap in bleaching—cooked by steam, the potato is the most wholesome and nutritious, and at the same time, the most economical of all vegetable aliments—by different manipulations it furnishes two kinds of flour, a gruel, and a parenchyma, which in times of scarcity may be made into bread, or applied to increase the bulk of bread made from grain,—to the invalid it furnishes both aliment and medicine: its starch is not in the least inferior to the Indian arrow-root, and Dr. Latham has lately shown that an extract may be prepared from its leaves and flowers, which possesses valuable properties as an anodyne remedy.*

The history of the warm bath† presents us with another curious instance of the vicissitudes to which the reputation of our valuable resources are so universally exposed; that which for so many ages was esteemed the greatest luxury in health,‡ and the most efficacious remedy in disease, fell into total disrepute in the reign of Augustus, for no other reason than because Antonius Musa had cured the Emperor of a dangerous malady by the use of the *cold* bath. The most frigid water that could be procured was, in consequence, recommended on every occasion; thus Horace in his epistle to Vala, exclaims—

> "—Caput ac stomachum supponere fontibus audent
> Clusinis, Gabiosque petunt, et frigida rura."
> Epist. xv. Lib. 1.

This practice, however, was doomed but to an ephemeral popularity, for although it had restored the Emperor to health, it shortly afterward killed his nephew and son-in-law, Marcellus; an event which at once deprived the remedy of its credit, and the physician of his popularity.

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* Med. Trans. of the College of Physicians, vol. vi. p. 92.

† That the *warm* and not the *cold* bath was esteemed by the ancient Greeks for its invigorating properties, may be inferred from a dialogue of Aristophanes, in which one of the characters says, "I think none of the sons of the gods ever exceeded Hercules in bodily and mental force,"—upon which the other asks, "Where didst thou ever see a COLD bath dedicated to Hercules?"

‡ The prohibition of the bath was numbered among the mortifications to which certain priestesses in Greece were bound by the rigid rules of their order.

The history of the Peruvian bark would furnish a very curious illustration of the overbearing influence of authority in giving celebrity to a medicine, or in depriving it of that reputation to which its virtues entitle it. This heroic remedy was first brought to Spain in the year 1632, and we learn from Villerobel that it remained for seven years in that country before any trial was made of its powers, a certain ecclesiastic of Alcala, being the first person in Spain to whom it was administered in the year 1639; but even at this period its use was limited, and it would have sunk into oblivion but for the supreme power of the Roman church, by whose auspices it was enabled to gain a temporary triumph over the passions and prejudices which opposed its introduction; Innocent the Tenth, at the intercession of Cardinal de Lugo, who was formerly a Spanish Jesuit, ordered that the nature and effects of it should be duly examined, and upon being reported as both innocent and salutary, it immediately rose into public notice;* its career, however, was suddenly stopped by its having unfortunately failed, in the autumn of 1652, to cure Leopold, Archduke of Austria, of a Quartan Intermittent; this disappointment kindled the resentment of the prince's principal physician, Chifletius, who published a violent philippic against the virtues of Peruvian Bark, which so fomented the prejudices against its use, that it had nearly fallen into total neglect and disrepute.

Thus there exists a fashion in medicine as in the other affairs of life, regulated by the caprice, and supported by the authority of a few leading practitioners, which has been frequently the occasion of dismissing from practice valuable medicines, and of substituting others less certain in their effects, and more questionable in their nature. As years and fashions revolve, so have these neglected remedies, each in its turn, risen again into favour and notice, whilst old receipts, like old almanacs, are abandoned until the period may arrive, that will once more adapt them to the spirit and fashion of the times. Thus it happens that most of our *New Discoveries* in the Materia Medica have turned out to be no more than the revival and adaptation of ancient practices. In the last century, the root of the *Aspidium Filix*, the Male Fern, was retailed as a secret nostrum by Madame Nouffleur, a French empiric, for the cure of tape worm; the secret was purchased for a considerable sum of money by Louis XV. and the physicians then discovered that the same remedy had been administered in that complaint by Galen.*

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* T. Bartholini Hist. Anat. et Med. cent. v. Hafniæ. Med. Transactions, vol. 3. p. 177.

The history of popular medicines for the cure of Gout, will also furnish us with ample matter for the illustration of this subject. The celebrated Duke of Portland's Powder was no other than the *Diacentaureon* of Cælius, Aurelianus, or the *Antidotos ex duobus Centaureæ generibus* of Ætius,† the receipt for which a friend of his Grace brought from Switzerland; into which country it had been probably introduced by the early medical writers, who had transcribed it from the Greek volumes soon after their arrival into the western parts of Europe. The active ingredient of a no less celebrated remedy for the same disease, *the Eau Medicinale*,‡ has been discovered to be the *Colchicum Autumnale*, or Meadow Saffron; upon investigating the properties of this medicine, it was observed that similar effects in the cure of the gout were ascribed to a certain plant, called *Hermodactyllus*‖ by Oribasius and Ætius, but more particularly by Alexander of Tralles,§ a physician of Asia Minor in the fourth century; an inquiry was accordingly instituted after this unknown plant, and upon procuring a specimen of it from Constantinople, it was actually found to be a species of *Colchicum*.

The use of Prussic acid in the cure of Phthisis, which has been lately proposed by Dr. Majendie, and introduced into the *Codex Medicamentarius* of Paris, is little else than the revival of the Dutch practice in this complaint; for Linnæus informs us, in the fourth volume of his *Amœnitates Academicæ*," that distilled Laurel water was frequently used in Holland for the cure of pulmonary consumption.

The celebrated fever powder of Dr. James was evidently not his original composition, but an Italian nostrum invented by a person of the name of Lisle, a receipt for the preparation of which is to be found at length in *Colborne's Complete English Dispensatory for the year* 1756.

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* Madame Nouffleur's Receipt is as follows.—"Three drachms of the root of the Male Fern, reduced to a fine powder, and mixed with water—this constitutes one dose. Two hours after taking the powder, a bolus of Calomel, Scammony, and Gamboge is to be administered.

† Duke of Portland's Powder for the Gout.—Equal quantities of the roots of Gentian, and Birthwort (Aristolochia rotunda) the tops and leaves of Germander (chamædrys) Ground Pine (chamæpitys) and lesser Centaury, (Chironea Centaurium) powdered, and mixed together.—As this is a combination of bitters, it will, without doubt, be serviceable in certain cases of Gout.

‡ This medicine was brought into vogue by M. Husson, a military officer in the service of France, about fifty years ago.

‖ So popular was this plant that it acquired the title of *Anima articulorum*. It formed the basis of the Dia Articulorum—the Pulvis Arthriticus Turneri, and The Vienna Gout Decoction.

§ Alexander's Prescription consisted of *Hermodactylls*, Ginger, Pepper, Cummin seed, Aniseed, and Scammony; which, says he, will enable those who take it to walk immediately.

The various secret preparations of Opium, which have been extolled as the invention of modern times, may be recognised in the works of ancient authors; for instance, Wedelius in his *Opiologia* describes an acetic solution; and the *Magisterium* of Ludovicus, as noticed by Etmuller, was a preparation made by dissolving Opium in vinegar, and precipitating with Salt of Tartar:* Van Helmont recommends a preparation, similar to the black drop, under the title of *Laudanum Cydoniatum:* then again we have Langelott's Laudanum, and Le Mort's "*Extract out of Rain water*," preparations which owe their mildness to the abstraction of the resinous element of opium.

The works of Glauber contain accounts of many discoveries that have been claimed by the chemists of our own day; he recommends the use of muriatic acid in sea scurvy, and describes an apparatus for its preparation exactly similar to that which has been extolled as the invention of Woolf; he also notices the production of *Pyro acetic Acid*, under the title of "*Vinegar of Wood*," so that the fact of the identity of this acid and Vinegar, so lately announced by Vauquelin as a *New Discovery*, was evidently known to Glauber nearly two centuries ago.

Nor has fashion confined her baneful interference to the selection of remedies; she has ventured even to decide upon the nature of Diseases, and to change and modify their appellations according to the whim and caprice by which she is governed. The Princess, afterward Queen Anne, was subject to Hypochondriacal attacks, which her Physicians pronounced to be *Spleen*, *Vapours*, or *Hyp*, and recommended Rawleigh's Confection, and Pearl Cordial for its cure; this circumstance was sufficient to render both the Disease and Remedy *fashionable*, and no other complaint was ever heard of in the precincts of the court but that of the *Vapours:* some years afterward, in consequence of Dr. Whytt's publication on "*Nervous diseases*," a lady of Fashion was pronounced to be *Nervous*—the term became general, and the disease *fashionable;* and *Spleen*, *Vapours*, and *Hyp* were consigned to oblivion: the reign of Nervous Diseases, however, did not long continue, for a popular work appeared on Biliary Concretions, and all the world became *bilious*. We have not patience to pursue the history of these follies; a transient glance at the ephemeral productions of the last twenty years would furnish a sad display of the versatility of medical opinions, and the instability of the practice which has been founded upon them: and they will no doubt furnish the future historian with strong and forcible illustrations.

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* "Magisterium Opii fit solvendo Opium in aceto, et præcipitando cum sale tartari.——————"

THE ASSIGNING TO ART THAT WHICH WAS THE EFFECT OF UNASSISTED NATURE, OR THE CONSEQUENCE OF INCIDENTAL CHANGES OF HABIT, DIET, &c.

Our inability upon all occasions to appreciate the efforts of nature in the cure of disease, must always render our notions, with respect to the powers of art, liable to numerous errors and multiplied deceptions. Nothing is more natural, and at the same time more erroneous, than to attribute the cure of a disease to the last medicine that had been employed; the advocates of amulets and charms,* have even been thus enabled to appeal to the testimony of what they call experience, in justification of their superstitions; and cases which in truth and justice ought to be considered most lucky escapes, have been triumphantly pronounced as skilful cures; and thus have medicines and practitioners alike acquired unmerited praise or unjust censure. Upon Mrs. Stephens offering her remedy for the stone to Parliament,† a committee of professional men was nominated to ascertain its efficacy; a patient with stone was selected, and he took the remedy; his sufferings were soon relieved, and upon examining the bladder in the usual way, no stone could be felt; it was therefore agreed that the patient had been cured, and that the stone had been dissolved; sometime afterward this patient died, and on being opened, a large stone was found in a pouch, formed by a part of the bladder, and which communicated with it. When the yellow fever raged in America, the practitioners trusted exclusively to the copious use of mercury; at first, this plan was deemed so universally efficacious, that in the enthusiasm of the moment, it was triumphantly proclaimed that death never took place after the mercury had evinced its effect upon the system; all this was very true, but it furnished no proof of the efficacy of that metal, since the disease, in its aggravated form, was so rapid in its career, that it swept away its victims long before the system could be brought under mercurial influence, while in its milder shape it passed off equally well without any assistance from art. Let us then, before we decree the honours of a cure to a favourite medicine, carefully and candidly ascertain the exact circumstances under which it was exhibited, or we shall rapidly accumulate examples of the fallacies to which our art is exposed; what has been more common than to attribute to the efficacy of a mineral water, those fortunate changes of constitution that have entirely or in great measure arisen from salubrity of situation, hiliarity of mind, exercise of body, and regularity of habits, which have incidentally accompanied its potation. Thus, the celebrated John Wesley, while he commemorates the triumph of Sulphur and Supplication over his bodily infirmity, forgets to appreciate the resuscitating influence of four months repose from his apostolic labours; and such is the disposition of the human mind to place confidence in the operation of mysterious agents, that we find him more disposed to attribute his cure to a brown paper plaster of egg and brimstone, than to Dr. Fothergill's salutary prescription of country air, rest, asses' milk, and horse exercise.* The ancient physicians duly appreciated the influence of such agents; their temples, like our watering places, were the resort of those whom medicine could not cure, and we are expressly told by Plutarch that these temples, especially that of Esculapius, were erected on elevated spots, with the most congenial aspects; a circumstance which, when aided by the invigorating effects of hope, by the diversions which the patient experienced in his journey, and perhaps by the exercise to which he had been unaccustomed, certainly performed many cures. It follows then that in the recommendation of a *watering place*, something more than the composition of the mineral spring is to direct our choice,—the chemist will tell us, that the springs of Hampstead and Islington rival those of Tunbridge and Malvern, that the waters of Bagnigge Wells, as a chalybeate purgative, might supersede those of Cheltenham and Scarborough, and that an invalid would frequent the spring in the vicinity of the Dog and Duck, in St. George's Fields, with as much advantage as the celebrated Spa at Leamington; but the physician is well aware that by the adoption of such advice, he would deprive his patient of those most powerful auxiliaries to which I have alluded, and above all, lose the advantages of the "*Medicina Mentis.*" On the other hand, the recommendation of change of air and habits will rarely inspire confidence, unless it be associated with some medicinal treatment; a truth which it is more easy and satisfactory to elucidate and enforce by examples than by precept —let the following story by Voltaire serve as an illustration.— "Ogul, a voluptuary who could be managed but with difficulty by his physician, on finding himself extremely ill from indolence and intemperance, requested advice :—'Eat a Basilisk, stewed in rose water,' replied the physician. In vain did the slaves search for a *Basilisk*, until they met with Zadig, who, approaching Ogul, exclaimed, 'Behold that which thou desirest ;' 'but, my Lord,' continued he, 'it is not to be eaten ; all its virtues must enter through thy pores, I have therefore enclosed it in a little ball, blown up, and covered with a fine skin ; thou must strike this ball with all thy might, and I must strike it back again, for a considerable time, and by observing this regimen, and taking no other drink than rose water for a few days, thou wilt see, and acknowledge the effect of my art.' The first day Ogul was out of breath, and thought he should have died from fatigue ; the second he was less fatigued, and slept better : in eight days he recovered all his strength ; Zadig then said to him, 'There is no such thing in nature as a Basilisk ! but *thou hast taken exercise and been temperate, and hast therefore recovered thy health !*'

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* This species of delusion, from mistaking the *Post hoc*, for the *Propter hoc*, always reminds me of the story of the Florentine Quack, who gave the countryman six pills which were to enable him to discover his lost Ass,—the pills beginning to operate on his road home, obliged him to retire into a wood, where he found his ass. The clown soon spread a report of the wonderful success of the empiric, who in consequence, no doubt, reaped an ample reward from the proprietors of strayed cattle.

† The grant of £5000 to Joanna Stephens, 'for her discovery of certain medicines for the cure of the Stone, is notified in the London Gazette of June, A.D. 1739. See Liquor Calcis.

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* Wesley's Journal, vol. xxix. 290—293.

AMBIGUITY OF NOMENCLATURE.

It has been already stated that we are to a great degree ignorant of the Simples used by the ancient Physicians ; we are often quite unable to determine what the plants are of which Dioscorides treats. It does not appear that out of the 700 plants of which his Materia Medica consists, that more than 400 are correctly ascertained ; and yet no labour has been spared to clear the subject of its difficulties ; Cullen even laments that so much pains should have been bestowed upon so barren an occasion.* The early history of botany presents us with such a chaos of nomenclature, that it must have been impossible for the herbarist and physician to have communicated their mutual lights; every one was occupied with disputes upon words and names, and every useful inquiry was suspended, from an inability to decide what plant each author intended; thus, for instance, the *Herba Britannica* of Dioscorides and Pliny, so celebrated for the cure of the soldiers of Julius Cæsar on the Rhine, of a disease call '*Scelotyrbe*,' and supposed to resemble our sea scurvy, remains quite unknown, notwithstanding the labours of our most intelligent commentators.* It seems also very doubtful whether the plant which we denominate *Hemlock* was the poison usually administered at the Athenian executions,† and which deprived Socrates and Phocion of life. Pliny informs us that the word *Cicuta*, among the ancients, was not indicative of any particular species of plant, but of vegetable poisons in general; this is a circumstance to which I am particularly anxious to fix your attention; it is by no means uncommon to find a word which is used to express general characters, subsequently become the name of a specific substance in which such characters are predominant; and we shall find that some important anomalies in nomenclature may be thus explained. The term '*Αρσενικον*,' from which the word *Arsenic* is derived, was an ancient epithet, applied to those natural substances which possessed strong and acrimonious properties, and as the poisonous quality of arsenic was found to be remarkably powerful, the term was especially applied to Orpiment, the form in which this metal more usually occurred. So the term *Verbena* (quasi *Herbena*) originally denoted *all those* herbs that were held sacred on account of their being employed in the rites of sacrifice, as we learn from the poets;‡ but as *one* herb

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* Soon after the invention of the art of Printing, the works of Dioscorides, Theophrastes, and Pliny, were published in various forms, and Commentators swarmed like locusts. The eagerness with which this branch of knowledge was cultivated may be conceived, when it is stated that the Commentary of Matthiolus on Dioscorides, which was first printed in 1554, passed through seventeen editions, and that 32,000 copies had been sold before the year 1561 ; and he tells us in this work, that he received in its execution the assistance and reward of Emperors,—Kings,—Electors of the Roman Empire,—Archdukes,—Cardinals,—Bishops,—Dukes, and Princes, 'which,' says he, 'gives

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greater credit to our labours than any thing that could be said.' In very many cases. however, says Dr. Pultney, 'this learned Commentator mistook the road to truth, and did but perplex the science he so industriously laboured to enlighten.'

*Turner, the father of English Botany, was of opinion, that it was the *Polygonum Bistorta*; Munting, a Dutch physician, that it was the *Hydrolapathum Magnum*, or *Rumex Aquaticus*, or Great Water-Dock, an opinion which received the sanction of Ray. Others have supposed it to have been *Polygonum Persicaria*, and some have considered it as the *Primula Auricula*. This one example is adduced to show the mortifying uncertainty that involves the history of ancient plants.

† Meade thinks that the Athenian poison was *a combination of active Substances*,—perhaps that described by Theophrastus as the invention of Thrasyas, which, it was said, would cause death without pain, and into which *Cicuta* and *Poppy* entered as ingredients.

‡ "Verbenasque adole pingues, et Mascula Thura."
Vir. Eclog. viii.

was usually adopted upon these occasions, the word *Verbena* came to denote that particular herb *only*, and it is transmitted to us to this day under the same title, viz. *Verbena*, or *Vervain*, and indeed until lately it enjoyed the medical reputation which its sacred origin conferred upon it, for it was worn suspended around the neck as an amulet. *Vitriol*, in the original application of the word, denoted *any* crystalline body with a certain degree of transparency (*Vitrum*;) it is hardly necessary to observe that the term is now appropriated to a particular species: in the same manner, *Bark*, which is a general term, is applied to express *one* genus, and by way of eminence, it has the article, *The*, prefixed, as *The* Bark: the same observation will apply to the word *Opium*, which in its primitive sense signifies *any* juice, (οπος *Succus*) while it now only denotes *one* species, viz. that of the Poppy. So again, *Elaterium* was used by Hippocrates, to signify various internal applications, especially purgatives, of a violent and drastic nature (from the word 'Ελαυνω,' *agito, moveo, stimulo*,) but by succeeding authors it was *exclusively* applied to denote the active matter which subsides from the juice of the *wild cucumber*. The word *Fecula*, again, originally meant to imply *any* substance which was derived by spontaneous subsidence from a liquid, (from *fæx*, the grounds or settlement of *any* liquor;) afterward it was applied to *Starch*, which is deposited in this manner by agitating the flour of wheat in water; and lastly, it has been applied to a peculiar vegetable principle, which like *starch** is insoluble in cold, but completely soluble in boiling water, with which it forms a gelatinous solution; this indefinite meaning of the word *fecula* has created numerous mistakes in pharmaceutic chemistry; Elaterium, for instance, is said to be *fecula*, and in the original sense of the word it is properly so called, inasmuch as it is procured from a vegetable juice by spontaneous subsidence, but in the limited and modern acceptation of the term, it conveys an erroneous idea; for instead of the active principle of the juice residing in *fecula*, it is a peculiar proximate principle, *sui generis*, to which I have ventured to bestow the name of *Elatin*. For the same reason, much doubt and obscurity involve the meaning of the word *Ex-*

"Ex Ara hac sume Verbenas tibi." *Terent. Andria.*
"ara castis
vincta Verbenis."——*Hor. Od. xi. Lib. iv.*

It is a curious fact that in Tuscany the word *Vervena* is applied to denote any kind of slips, shoots, suckers, or bundles of plants, at this very day.

* Amlyum, the *Starch* of wheat, originally denoted a powder that was obtained without the application of a mill, from α, not, and μυλος, a mill; thus Dioscorides, "Αμυλον ὠνόμασαι δὶα τὸ χωρὶς μυλων κατασκευαζεσθαι—i. e. *because it is prepared without a mill.*

tract, because it is applied *generally* to any substance obtained by the evaporation of a vegetable solution, and *specifically* to a peculiar proximate principle, possessed of certain characters, by which it is distinguished from every other elementary body—See *Extracta*. On the other hand, we find that many words which were originally only used to denote particular substances, have, at length, become subservient to the expression of General Characters; thus the term *Alkali*, in its original sense, signified that particular residuum which was alone obtained by lixiviating the ashes of the plant named *Kali*, but the word is now so generalized that it denotes *any* body possessed of a certain number of properties.

Another source of botanical ambiguity and error is the circumstance of certain plants having acquired the names of others very different in their nature, but which are supposed to possess a similarity in external character; thus our POTATO,* (*Solanum Tuberosum*) when it was first imported into England by the colonists in the reign of Queen Elizabeth, gained its appellation from its supposed resemblance to an esculent vegetable at that time in common use, under the name of the Sweet Potato (*Convolvulus Battatas*,) and which, like *Eringo Root*, had the reputation of being able to restore decayed vigour, thus Falstaff—

> "Let the sky rain Potatoes, hail kissing Comfits, and snow Eringoes."
> *Merry Wives of Windsor*, Act 5, Scene 5.

A similar instance is presented to us in the culinary vegetable well known under the name of the JERUSALEM ARTICHOKE, which derived its appellation in consequence of its flavour having been considered like that of the common artichoke; it is hardly necessary to observe that it has no botanic relation whatever to such a plant, it being an Heliotrope (*Heliotropium Tuberosum*,) the epithet *Jerusalem* is a curious corruption of the Italian term *Gira-Sole*, that is, *turn sun*, in English, or *Helio-trope* in Greek. This instance of Verbal corruption is not solitary in medical botany; CASTOR OIL will suggest itself as another example; this oil, from its supposed efficacy in curing and assuaging the unnatural heat of the body, and in soothing the passions, was called by the French *Agnus Castus*, whence the inhabitants of St. Kitt's in the West Indies, who were formerly blended with the French in that island, called it *Castor* oil. In some cases again, a plant has received a name compounded of two ancient ones; it appears from Pliny that the *Assarum* was not uncommonly confounded with the *Baccharis*; an English name was accordingly bestowed upon it, which is a curious compromise of the question, for it is a compound of both, viz. *Assara bacca*.

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* Gerard, in his Herbal, (1597) denominates it, by way of distinction, Potato of Virginia, and he recommends it to be eaten as a delicate dish, not as common food; indeed some time elapsed after its introduction before it became general, and it was cultivated as an article of diet in Ireland for several years before it was common in England.

The advanced state of BOTANICAL SCIENCE will now prevent the recurrence of those doubts and difficulties which have formerly embarrassed the history of vegetable remedies, by furnishing a strictly philosophical language, independent of all theory, and founded upon natural structure, and therefore necessarily beyond the control of opinion; while the advancement of chemical knowledge, by enabling us better to distinguish and identify the different substances we employ, will also materially assist in preventing the confusion which has formerly oppressed us. At the same time, I am unwilling to join in the commendations which have been so liberally bestowed upon our chemical nomenclature; nay, I am disposed to consider it as a matter of regret that the names of our medicinal compounds should have any relation to their chemical composition, for in the present unsettled state of this science, such a language must necessarily convey theory instead of truth, and opinions rather than facts; in short, it places us at the mercy and disposal of every new hypothesis, which may lay our boasted fabric in ruins, and in its place raise another superstructure, equally frail in its materials, and ephemeral in its duration: thus CORROSIVE SUBLIMATE was a *muriate* of Mercury, or an *oxy-muriate*, until Sir H. Davy established his new theory of chlorine, and then it became a *bi-chloride*; at some future period, Chlorine will be found to be a compound, and then it must have another name; for the same reason the term CALOMEL* is surely to be preferred to *submuriate*, or *Chloride*. TARTARIZED ANTIMONY, again, has been called by our nomenclatural reformers the *Tartrate of Antimony and Potass*: but is it a triple compound? Gay Lussac thinks not, and considers it as a combination, in which *Cream of Tartar* acts the part of a simple acid. The French, in their new *codex*, are still more extravagant in their application of chemical nomenclature; thus, the subcarbonate of potass is called by them *sub-deuto-carbonas potassii*. The first part of this quadruple name indicates the comparative quantity of acid in the salt, the second that of oxygen contained in the base, the third announces the acid, and the fourth the basis of the base!

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* Calomel.—There is some doubt respecting the original meaning of this word, literally it signifies, *fair*, *black*, καλος, μελας. Sir Theodore Mayerne is said to have given the name to it, in consequence of his having had a favourite black servant who prepared it; but is it not more probable that its name was derived from the change of colour which it undergoes from *black* to *white*, during its preparation? Another explanation has been also given, viz. quòd *nigro* humori sit *bonum*—a *good* (καλος) remedy for *black* (μελας) bile. This Theory derives much support from the black appearance of the stools, which is usually produced by the use of Calomel, and which was erroneously attributed to the searching and efficacious nature of the purgative.

THE PROGRESS OF BOTANICAL SCIENCE.

It has been just stated that we have derived from botanical science a philosophical language, which enables us to describe the structure and habits of any plant with a luminous brevity and an unerring perspicuity; but we are moreover indebted to botany for another service no less important to the successful investigation of the materia medica,—that of throwing into well-defined groups those plants which possess obvious natural affinities, and which will be found at the same time to present certain medicinal analogies; indeed, as a general rule, we may admit the axiom, "*Quæ genere conveniunt, virtute conveniunt.*"*

The *Umbelliferæ* which grow on dry ground are aromatic, whilst the aquatic species are among the most deadly poisons. The *Cruciform* plants are aromatic and acrid in their nature, containing essential oils, (hence the peculiar smell of cabbage-water, &c.) which are obtainable by distillation; and Linnæus asserts that "among all the *Leguminous* or *Papilionaceous* tribe there is no deleterious plant to be found:" this, however, is not exactly true. Some of the individuals in these natural orders, although very nearly related, do nevertheless possess various, and even opposite qualities; in the leguminous tribe above mentioned, which is as consistent as any one we possess, we have the *Cytisus Laburnum*, the seeds of which are violently emetic, and those of *Lathyrus Sativus*, which have been supposed at Florence to soften the bones, and cause death.

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* Dr. Blair thinks that the ancients were led in many instances by the comparison of habit, to ascribe similar virtues to plants; there does not however appear to be a trace of what may be called System, in the writings of Theophrastus, Dioscorides, or Pliny. Cæsalpinus was the father of botanical system, and he was probably the first who suggested the idea that the virtues of plants were discoverable by their structure and alliance to each other. In his preface to his work, "*De Plantis*," he says, "Quæ enim generis societate junguntur, plerumque et similes possident facultates." This idea was pursued by Petiver, an apothecary in the City of London, a name well known in the annals of Botany; there is a paper by him on this subject, in the 21st volume of the Philosophical Transactions, entitled, "Some attempts to prove that herbs of the same make and class, for the generality, have the like Vertue, and Tendency to work the same Effects." Dr. Murray has adopted an arrangement founded upon natural character in his celebrated work, entitled "*Apparatus Medicaminum*."

In the subdivision even of a genus there is often a remarkable difference in the properties of the species; there are for instance, *Solanums*, *Lettuces*, *Cucumbers*, and *Mushrooms*, both esculent and poisonous. The *Digitalis* or *Foxglove*, and the *Verbascum*, or common *Mullein* of our fields, are included in the same Natural family, and yet the one is as active as the other is mild in its effects; the plants of the natural family of *Contortæ* abound with a highly acrid milky juice, but Dr. Afzelius met with a shrub of this order at Sierra Leone, the milk of whose fruit was so sweet, as well as copious, as to be used instead of cream for tea; this is certainly what no one could have guessed from analogy. The same individual will vary from culture or other circumstances, as much as any two plants which have no botanic affinity; the Chamomile, *Anthemis Nobilis*, with which we are all acquainted, by cultivation, may have its whole disk changed to ligulate white florets, destitute of medicinal properties. But what is more embarrassing, the different parts of the same plant have often very different powers; a fact which is beautifully exemplified in the *Podophyllum Peltatum*, or May Apple, the *leaves* of which are poisonous, the root powerfully cathartic, and the *fruit* agreeably esculent; so the leaves of the *Jatropa Manihot* are employed as a common esculent, while its root secretes a most virulent poison; but we need not seek further for an example than the fruit of the Lemon, the juice of which is *acid*, its seeds *bitter*, and its rind *aromatic*: in some instances it happens that the energy of a plant is concentrated in one particular part, and that all the rest is absolutely inert; thus, the root of the *Convolvulus Scammonia*, is the only portion of that plant which possesses any medicinal quality;* yet notwithstanding all these difficulties, botany is capable of furnishing us with analogies, which will lead to important conclusions with respect to the medicinal properties of different vegetables.

The system of Linnæus, although in a great degree artificial, corresponds in a surprising manner with the natural properties of plants; thus a plant whose *calyx* is a double valved *glume*, with three *stamina*, two *pistils*, and one *naked seed*, bears seeds of a farinaceous and nutritious quality; a flower with twelve or more *stamina*, all of which are inserted in the internal side of the *calyx*, will furnish a wholesome fruit; whereas a plant whose flower has five *stamina*, one *pistil*, one *petal*, and whose fruit is of the *berry* kind, may at once be pronounced as poisonous.

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* Russel's Nat. Hist. of Aleppo.

It is also in a great degree true that the sensible qualities of plants, such as *colour*, *taste*, and *smell*, have an intimate relation to their properties, and may often lead by analogy to an indication of their powers; we have an example of this in the dark and gloomy aspect of the *Luridæ*, which is indicative of their narcotic and very dangerous qualities, as *Datura*, *Hyoscyamus*, *Atropa*, and *Nicotiana*. *Colour* is certainly, in many cases, a test of activity; the deepest coloured flowers of the *Digitalis*, for example, are the most active, and when the leaves of powerful plants lose their green hue, we may conclude that a corresponding deterioration has taken place with respect to their virtues, but Linnæus ascribed too much importance to such an indication, and his aphorisms are unsupported by facts; for instance, he says, "Color pallidus *insipidum*, viridis *crudum*, luteus *amarum*, ruber *acidum*, albus *dulce*, niger *ingratum*, indicat."* A peculiar heavy odour, which is well known, but is with difficulty defined, is a sure indication of narcotic properties. Bitterness, when not extreme, denotes a tonic quality, which will stimulate the stomach and intestines, and promote the process of digestion. When the bitterness is more intense and pungent,† as in *Aloes*, *Colocynth*, *&c.* we may infer that such substances will produce a more active effect upon the *primæ viæ*, and that catharsis will ensue.

Botanical, like human physiognomy, may frequently afford an insight into character, but it is very often a fallacious index. With regard to the indications of *Smell* and *Taste*, it may be observed that in the examination of an unknown substance we instinctively apply to these senses for information respecting its properties. It is certainly reasonable to suppose that those bodies which produce upon the organs of taste a sensible, astringent, or pungent effect, may occasion an impression, corresponding in degree upon the stomach or intestines, which are but an extension of the same structure. But what numerous exceptions are there to such a law? nay, some of the most poisonous substances affect in a very slight degree the organs of taste, especially those that belong to the mineral kingdom, as *Arsenious Acid*, *Oxyd of Antimony*, *Calomel*, *&c.* yet some of these are in fact but apparent exceptions, depending upon the degree of solubility which they possess, in consequence of which their energies are not developed until they have traversed a considerable portion of mucous surface. Nor ought it to be forgotten, that cultivation and artificial habits may have blunted the natural susceptibility of our organs, and in some instances changed and depraved their functions: certain qualities for instance are so strongly connected with each other by the chain of association, that by presenting only one to the mind, the other links follow in succession.* It has been remarked that persons in social life, are more affected by vegetable odours, while the Savage smells better the putrid and fœtid exhalations of animal bodies:† thus the people of Kamskatcha did not smell the perfume of a vegetable Essence, (*Aqua Melissæ*,) but they discovered by their olfactory sense, a rotten fish, or a stranded whale, at a considerable distance.‡ There is no sense more under the dominion of the imagination, or more liable to be perverted by education, than those of taste and smell; we are also liable to form unjust prejudices from the indications of colour; for particular colours, from the influence of hidden associations, are not unfrequently the exciting cause of agreeable or unpleasant impressions. I have met with a person who regards green food, if it be of an animal nature, with unconquerable aversion and disgust, indeed, an idea of unwholesomeness has not unfrequently been attached to this colour, without the least foundation of truth; the bones of the Gar-fish, or Sea-Needle, (*Esox Helone*,) have been deemed unwholesome from the circumstance of their turning green on being boiled, although not a single instance can be adduced in which that fish ever occasioned any harm. I have met with persons who have been made violently sick from eating the green part of the oyster,* an effect which can have no other cause than that of unjust prejudice; these examples are sufficient to show with what caution such indications respecting the medicinal qualities of bodies are to be received.

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*The student will find an interesting dissertation upon this subject in a late work, entitled, "L'Histoire Naturelle des Medicamens." Par J. J. Virey. 1820.

† Lord Bacon attributes the operation of purgatives to three causes, viz. 1, to extreme bitterness, as in Aloes, 2, to loathsomeness and horrible taste, as in Agaric and black Hellebore, and 3, to a secret malignity, as in antimony, &c.

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* This might be illustrated by the recital of numerous fallacies to which our most simple perceptions are exposed from the powers of association, but I will relate an anecdote, which to my mind elucidates the nature and extent of such fallacies more strikingly than any example which could be adduced. Shortly after Sir Humphrey Davy had succeeded in decomposing the fixed alkalies, a portion of *Potassium* was placed in the hand of one of our most distinguished chemists, with a query as to its nature; the philosopher observing its aspect and splendour, did not hesitate in pronouncing it to be metallic, and uniting at once the idea of weight with that of metal, the evidence of his senses was even insufficient to dissever ideas so inseparably associated in his mind, and balancing the specimen on his fingers, he exclaimed, "it is certainly metallic, and *very ponderous!*" Now this anecdote is not related in disparagement to the philosopher in question. Who could have been prepared to meet with a substance, so novel and anomalous as to overturn every preconceived notion?—A METAL SO LIGHT AS TO SWIM UPON WATER, AND SO INFLAMMABLE AS TO CATCH FIRE BY THE CONTACT OF ICE!

† Virey, "Essai d'Historie Naturelle et Physicolog: sur la perfectibilité de l'homme."

‡ Second Voyage of Captain Cook, vol. iv.

THE APPLICATION AND MISAPPLICATION OF CHEMICAL SCIENCE.

Among the researches of different authors, who, animated with a sacred zeal for ancient learning, have endeavoured to establish the antiquity of chemical science, we find many conclusions deduced from an ingenious interpretation of the mythological fables† which are supposed to have been transmitted by the Egyptians, who, previous to the invention of letters, adopted this method of perpetuating their discoveries in natural philosophy. Thus, wherever Homer studiously describes the stolen embraces of Mars and Venus, they recognise some chemical secret, some combination of iron with copper, shadowed in the glowing ornaments of fiction. Lord Bacon‡ conceived that the union of spirit and matter was allegorized in the fable of Proserpine being seized by Pluto as she was gathering flowers; an allusion, says Dr. Darwin, which is rendered more curiously exact by the late discovery, that pure air (*oxygen*) is given out by vegetables, and that in this state it is greedily absorbed by inflammable bodies. The same ingenious Poet supposes that the fable of Jupiter and Juno, by whose union the vernal showers were said to be produced, was meant to portray the production of water by the combination of its two elements, an opinion which, says he, is strongly supported by the fact that, in the ancient mythology, the purer air or *æther*

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*The cause of the green colour of oysters is sometimes an operation of nature, but it is more generally produced by art, by placing them in situations where there is a green deposite from the sea, which appears to consist of the vegetating germs of marine *Confervæ* and *Fuci*, and which impart their colour to the oysters. For this object the Dutch formerly took oysters from beds on our coasts, and deposited them on their own. Native oysters transported into the Colchester beds soon assume a green colour. It is unnecessary to refute the popular error which attributed this change of colour to the operation of copperas.

† We must admit that some of these allegories are too obivous to be mistaken. Homer attributes the plague that prevailed in the Grecian camp to the darts of Apollo: what was meant by this, but that it arose from the action of a burning sun upon the marshes, and slimy shores of Troas? and what, again, can be more obvious than the allegory by which Echo is made the daughter of air and earth.

‡ Bacon's works, vol. v. p. 470. Editio, 4to. London, 1778.

was always represented by Jupiter, and the inferior by Juno. Were the elegant author of the Botanic Garden now living, he would no doubt, with a taste and delicacy peculiarly his own, avail himself of the singular discovery of Mr. Smithson, who has detected in the juice of the mulberry *two* distinct species of colouring matter; the mingled blood of the unfortunate Pyramus and Thisbe:

> "Signa tene cædis: pullosque et luctibus aptos
> Semper habe fætus, *gemina* monumenta cruoris."
> *Ovid. Metamorph. Lib.* iv. 160.

Sir William Drummond, the learned apologist of Egyptian science, conceives that the laws of *latent* heat were even known to the philosophers of that ancient nation, and that caloric in such a state, was symbolically represented by VULCAN, while *free* or *sensible* caloric was as clearly described in the character of VESTA. Those who maintain the antiquity of chemistry, and suppose that the fabulous conceptions of the ancients were but a mysterious vail ingeniously thrown by philosophy between nature and the lower order of people, consider that the alchemical secret is metaphorically concealed in the fable of the GOLDEN FLEECE of the Argonauts, and reject the more probable solution of this story by Strabo, who says that the Iberians, near neighbours of the Colchians, used to receive the gold, brought down from the high lands by the torrents, into sieves and sheep-skins, and that from thence arose the fable of the golden fleece. Dionysius of Mytilene offers a different explanation of the fable, and supposes it to allude to a book *written on skins*, and containing an account of the process of *making gold* according to the art of alchemy.

But with whatever ingenuity and success the antiquity of chemical knowledge may be advocated, as it relates to the various arts of life, yet it must be allowed that not the most remote trace of its application to physic can be discovered in the medical writers of Greece or Rome. The operation of distillation* is not even mentioned by Hippocrates or Galen; and the waters of different plants, as described by some later authors, are to be understood, as we are informed by Gesner, merely as simple decoctions, and not as the products of any chemical process; while the Essences of Dioscorides, Galen,

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* Dioscorides and Pliny describe a process, which may be considered that of distillation in its infancy; it consists in obtaining oil from pitch, by spreading over it while boiling, fleeces of wool, which receive the vapour, and afterward yield it by expression.

Oribasius, and others, were only the extracts produced by the evaporation of such infusions.

Upon the downfal of the Roman Empire, all the sciences, the arts, and literature, were overwhelmed in the general wreck, and the early Mahometans, in the first paroxysms of their fanaticism, endeavoured to destroy every record of the former progress of the human mind; consigning to destruction, by the conflagration of the Alexandrian library, no less than seven hundred thousand volumes, which comprised the most valuable works of science and literature.* It is not a little extraordinary that this same people were destined, at a more advanced period, to rekindle the light of letters,† which they had taken such pains to extinguish, and to become the inventors and cultivators of a new science, boundless in its views, and inexhaustible in its applications. The medical profession too was more particularly selected as an object of reward and encouragement: and we may say, with much truth, that our *Materia Medica* is more indebted to the zeal and industry of the Arabians, than to the learning of the Greeks, or to the refinement of the Romans. From this source we have acquired the milder purges of *Manna*, *Cassia*, *Senna*, and *Rhubarb*, and many plants and oriental aromatics, among which we may notice *Musk*, *Nutmeg*, *Mace*, and *Cloves*; the introduction of which into medicine was greatly facilitated by the situation of Bagdat, and its connexion with India; and although Archigenes and Aretæus had long before applied *Blisters*, yet it is to the Arabian physicians that we are indebted for a practical acquaintance with their value, for in general, the Greeks and Romans prescribed acrid *sinapisms* for such a purpose. We are also indebted to the Arabians for our knowledge respecting Camphor, as its name imports, for the original word was *Cafur*, or *Canfur*.‡ They are also the first upon record, who speak of sugar and sugar candy, extracted from the sugar cane, which they call *honey of cane*; and they ushered into practice *Syrups*, *Juleps*, and *Conserves*. At the same time, it is but just to allow, that from the disgusting ostentation of this people, and their strong attachment to the marvellous, many absurd medicines have been introduced. Gold, Silver, Bezoars, and precious stones, were received into their materia medica, and surprising virtues were attributed to them. Among a people thus disposed to magnificence, and from the very spirit of their religion credulous and romantic, it is not a matter of surprise that their first researches into the nature of bodies should have raised a hope, and excited a belief, that the baser metals might be converted into gold.

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* It was destroyed in the sixth century, by the CALIPH OMAR, the cotemporary and companion of Mahomet.

† The Saracens, in their treaty with the Greek Emperors, demanded, by express articles, the works of the ancients.

‡ Garcias, as well as Geoffroy and Hill, say that Ætius mentions camphor, but it cannot be found, as Dr. Alston has observed, in that, or in any other Greek author. There is a *Camphoræ herba* in Myrepsus; this is evidently a very different thing.

They conceived that gold was the metallic element, in a state of perfect purity, and that all the other metals differed from it in proportion only to the extent of their individual contamination, and hence the origin of the epithet *base*, as applied to such metals; this hypothesis explains the origin of alchemy: but, in every history, we are informed that the earlier alchemists expected by the same means that they hoped to convert the *baser* metals into gold, to produce a universal remedy, calculated to prolong indefinitely the span of human existence.

It is difficult to imagine what connexion could exist in their ideas between the *Philosopher's Stone*, which was to transmute metals, and a remedy which could arrest the progress of bodily infirmity: upon searching into the writings of these times, it clearly appears that this conceit originated with the alchemists from the application of false analogies, and that the error was subsequently diffused and exaggerated by a misconstruction of alchemical metaphors.*

An example of reasoning by false analogy is presented to us by Paracelsus, in his work *de vita longa*, wherein, speaking of antimony, he exclaims, "*Sicut antimonium finit aurum, sic, eadem ratione et forma, corpus humanum purum reddit.*"

The processes of alchemy were always veiled in the most enigmatic and obscure language; the earliest alchemist whose name has reached posterity, is Geber, an Arabian prince of the seventh century, whose language was so proverbially obscure, that Dr. Johnson supposes the word gibberish or *geberish* to have been derived from this circumstance; sometimes the processes of alchemy were expressed by a figurative and metaphorical style of description, thus Geber exclaims, "*Bring me the six lepers that I may cleanse them;*" by which he implied the conversion of the six metals,* the only ones then known, into gold. From the works of later alchemists it also appears that they constantly represented *gold* as a sound, healthy, and durable man, the imperfect metals as diseased men, and the means or processes by which the latter were to be transmuted into the former, they designated by the name of *medicines;* and hence, those who were anxious to dive into the secrets of these magicians or **Adepts**, as they termed themselves, without possessing a key to their language, supposed that these descriptions were to be understood in a literal sense, and that the imperfect metals might be changed into gold, and the bodies of sick persons into healthy ones, by one and the same chemical preparation.

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* The Records of Physic, if I mistake not, will afford numerous instances of similar error, from mistaking figurative expressions for literal truths. A knowledge of this species of fallacy will explain the origin of several very extraordinary receipts. I shall select the following instance, by way of illustration. In many of the ancient works on Physic, we find the *blood of the goat* extolled for its efficacy in dissolving stones, and, from this supposed lithontriptic virtue, it forms the principal ingredient of the POWDER OF NICOLAUS, and of the ELECTUARY OF THE QUEEN OF COLEIN. The expression which gave origin to this belief was evidently allegorical, signifying that the blood of the goat, by which our Saviour was typified, was capable of softening the stony hearts of his enemies, or according to others, that by his influence, the stony rocks, and vail of the temple, were shattered. *Browne's Vulgar Errors.*

The hieroglyphical style of writing adopted by the earlier alchemists, was in a great degree supported by the prevailing idea that the elements were under the dominion of spiritual beings, who might be submitted to human power; and Sir Humphrey Davy has observed that the notions of fairies, and of genii, which have been depicted with so much vividness of fancy and liveliness of description in THE THOUSAND AND ONE NIGHTS, seem to have been connected with the pursuit of the science of transmutation, and the production of the elixir of life. That the Arabian Nights Entertainment admits of a mystic interpretation, is an opinion which I have long entertained. How strikingly is the effect of fermented spirit, in banishing the pressure of the melancholy which occurs in solitude, depicted in the story of Sinbad when he encountered the withered and decrepit hag, on the uninhabited island—but, to return from this digression to the subject of medical chemistry.

It was not in fact until several years had elapsed in the delusive researches of alchemy, that the application of chemical knowledge became instrumental in the advancement of the medical art. RHASES and AVICENNA, who were the celebrated physicians of the age, are the first who introduced pharmaceutical preparations into their works, or made any improvement in the mode of conducting pharmaceutical processes. Avicenna describes, particularly, the method of conducting *Distillation;* he mentions also, for the first time, the three *Mineral Acids*, and distinguishes between the *vegetable* and *mineral Alkalies;* he speaks likewise of the *Distilled Water of Roses*, of *Sublimed Arsenic*, and of *Corrosive Sublimate.*

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* Silver, Mercury, Copper, Iron, Tin, Lead.

In the year 1226, Roger Bacon, a native of Ilchester in Somersetshire, and a Franciscan monk of Westminster Abbey, laid the foundations of chemical science in Europe; his discoveries were so extraordinary that he was excommunicated by the Pope, and imprisoned ten years for supposed dealings with the devil; it appears that he was a believer in a universal Elixir, for he proposed one to Pope Clement the Tenth, which he extolled highly, as the invention of Petro de Maharncourt.

This wonderful man was succeeded at the end of the same century by Arnoldus de Villa Nova, a Frenchman, or as others assert, a Spaniard, who deserves to be noticed on this occasion, as being the first to recommend the distilled spirit of wine, impregnated with certain herbs, as a valuable remedy; from which we may date the introduction of *Tinctures* into medical practice; for, although Thaddæus, a Florentine, who died in 1270, at the age of eighty, bestows great commendation upon the virtues of *Spirit of Wine*, yet he never used it as a solvent for active vegetable matter.

It was not, however, until the end of the thirteenth century, that Chemistry can be said to have added any considerable power to the arm of Physic.

Basil Valentine, a German Benedictine monk, led the way to the internal administration of metallic medicine, by a variety of experiments on the nature of *Antimony*, and in his "*Currus Triumphalis Antimonii*," a work written in high Dutch, he has described a number of the combinations of that metal. If, however, we may credit a vague tradition, he was extremely unfortunate in his first experiments upon his brother monks, all of whom he injured if not killed; those who have keen ears for etymological sounds will instantly recognise, in this circumstance, the origin of the word *Antimony*, **ἀντι Μονοχῶς**.

It appears that the ancients were ignorant of the internal use and administration of the metals, with the exception of iron, although they frequently used them in external applications. Oribasius and Ætius added "*Lithargyrium*" to several plasters, and the composition of the "*Snow like plaster*," from *Minium*, was long preserved among their more valuable secrets. Whether antimony is the *Stimmi* or *Stibium* of the ancients has been a matter of conjecture; for Pliny, in speaking of its preparation observes, "Ante omnia urendi modus necessarius, ne *Plumbum* fiat." This plumbum, however, was evidently the revived metal of *Antimony*, with which the ancients were unacquainted, and therefore mistook it for *Lead*;

besides, the word *Plumbum*, like many others which I have before mentioned, was used as a general term; thus, according to Pliny, Tin was called *Plumbum album*.

The question, however, is unimportant, for this *Stibium* was never used but as an external Astringent, especially for the purpose of contracting the eyelids, and thereby of making the eyes appear very large, which has been considered from the most remote antiquity, as a feature of great beauty; thus the epithet βοῶπις is constantly applied by Homer to Juno. This practice appears also to have been followed by the Jews, for Jezebel is said to have painted her eyebrows to make the eyes appear big;[*] the expression also shows that the drug employed was the *Stimmi*. Εστιμμίσατο τους οφθαλμους ἀυτης.

To Basil Valentine we are moreover indebted for the discovery of the *Volatile Alkali*, and of its preparation from *Sal Ammoniac*; he also first used mineral acids as solvents, and noticed the production of *Ether* from Alcohol; he seems also to have understood the virtues of *sulphate of iron*, for he says, when internally administered, it is tonic and comforting to a weak stomach, and that externally applied, it is astringent and styptic: he moreover recommended a *fixed alkali* made from vine twigs cut in the beginning of March, for the cure of gout and gravel.

In the year 1493, was born near Zurich in Switzerland, Paracelsus, or as he termed himself, Philippus, Theophrastus, Bombastus, Paracelsus de Hohenheim, a man who was destined to produce a greater revolution in the Materia Medica, and a greater change in medical opinions and practice, than any person who had appeared since the days of Galen. He travelled all over the Continent of Europe to obtain knowledge in chemistry and physic, and was a great admirer of Basil Valentine, declaring that Antimony was not to be equalled for medicinal virtue, by any other substance in nature: this opinion however does not deserve our respect, for it was not founded upon observation and experiment, but on a fanciful analogy, derived from a property which this metal possesses of refining gold, as I have before related. He also used *Mercury* without reserve, and appears to have been the first who ventured to administer it internally,[†] for although Avicenna asserts that it was not so poisonous as the ancients had imagined, yet he does not attribute to it any virtues; he merely says, "Argentum quidem vivum, plurimi qui bibunt, *non læduntur* eo." Its effects, when applied externally, were well known to Theodoric the friar, afterward Bishop of Cervia, in the twelfth century, who describes the salivation which mercurial frictions will produce.

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[*] 2 Kings, chap. ix. verse 30.

[†] It has been already stated that we are indebted to an Indian for the discovery of Bark, and it now appears we derived our knowledge of Mercury to the wildest of the alchemists. May it not then be said that we are indebted to a *savage*, and a *madman*, for two of our most powerful remedies?

Paracelsus, thus armed with opium, mercury, and antimony, remedies of no trifling importance, travelled in all directions, and performed many extraordinary cures, among whom was the famous printer Frobenius of Basil, a circumstance which immediately brought him acquainted with Erasmus, and made him known to the magistracy of Basil, who elected him professor of chemistry in the year 1527, which was the first professorship that was established in Europe for the promotion and dissemination of chemical science.

While seated in his chair, he burnt with great solemnity the writings of Galen and Avicenna, and declared to his audience that if God would not impart the secrets of physic, it was not only allowable, but even justifiable, to consult the devil. His cotemporary physicians he treated with the most sottish vanity and illiberal insolence; in the preface to his work, entitled "Paragranum," he tells them "that the very down of his bald pate had more knowledge than all their writers, the buckles of his shoes more learning than Galen and Avicenna, and his beard more experience than all their Universities." With such a temper it could not be supposed that he would long retain his chair; in fact he quitted it in consequence of a quarrel with the magistrates, after which he continued to ramble about the country, generally intoxicated, and seldom changing his clothes, or even going to bed; and although he boasted of possessing a *Panacea* which was capable of curing all diseases in an instant, and even of prolonging life to an indefinite length, yet this drunkard and prince of empirics died after a few hours illness, in the forty-eighth year of his age, at Salzburg in Bavaria, with a bottle of his immortal *Catholicon* in his pocket.

In contemplating the career of this extraordinary man, it is difficult to say whether disgust or astonishment is the most predominant feeling; his insolence and unparalleled conceit, his insincerity and brutal singularities, and his habits of immorality and debauchery, are beyond all censure; whilst the important services he has rendered mankind, by opposing the bigotry of the schools and introducing powerful remedies into practice, cannot be recorded without feelings of gratitude and respect; but in whatever estimation Paracelsus may be held, there can be no doubt but that his fame produced a very considerable influence on the character of the age, by exciting the envy of some, the emulation of others, and the industry of all.*

About a century after Paracelsus, VAN HELMONT took the lead in physic; he was a man of most indefatigable industry, and spent fifty years in torturing by every chemical experiment he could devise, the various objects in the animal, vegetable, and mineral kingdoms. He was the first physician who applied *alum* in uterine hemorrhage, and he acquired a great reputation from the success of the practice.

SYLVIUS DE LA BOE, and OTHO TACHENIUS, followed in the track of Van Helmont.

A prejudice in favour of chemical remedies having been thus introduced, the merited success which attended their operation, and the zeal and perseverance which distinguished the votaries of that science, soon kindled a more general enthusiasm in its favour. It is impossible to reduce into miniature the historical features of these chemical times, so as to bring them within the compass of a lecture: I must therefore rest satisfied with delineating a few of the more prominent outlines. The Galenists, who were in possession of the schools, and whose reasonings were fettered by the strongest predilection for their own doctrines, instantly took the alarm; and the celebrated contest ensued between the *Galenical* and *Chemical* sects, which has given such a controversial tone to the writers of the fifteenth and sixteenth centuries. As this revolt from orthodox authority was in a great degree attributed to the mischievous introduction and unmerited success of Antimonial remedies, so were the preparations of this metal denounced with all the virulence of party spirit; and upon this occasion, in order to support their ground and oppress and persecute their adversaries, the Galenists actually solicited the assistance of secular power; the Supreme Council of Paris accordingly proscribed its use by an edict in 1566, and Besnier was expelled the faculty of medicine in 1609, for having administered it to a patient. In 1637, *Antimonial wine* was by public authority received into the number of purgatives; and in 1650, a new *arret* rescinded that of 1566, and again restored Antimony to public favour and general reputation; and before we conclude our remarks upon the revolutionary history of this extraordinary metal, it deserves to be remarked, that this very same government that had with such great virulence, and so little justice, persecuted every practitioner who had shown any predilection for its use, in the year 1720 actually purchased the secret of an antimonial preparation, called *Panacea Glauberiana*, and which has been since known by the title of *Kermes Mineral*, from a surgeon of the name of La Legerie, who had acquired the secret from a pupil of Glauber. Before this period the invention of *Calomel* had taken place; this preparation is first mentioned, although very obscurely, by Oswald Crollius, in his *Basilica Chemica*, in 1608, and in the same year Beguin described it most fully and clearly under the title of *Draco Mitigatus*, in his *Tirocinium Chemicum*, which he published in Paris.

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* Paracelsus maintained that the human body is composed of salt, sulphur, and mercury, and that in these "three first substances," as he calls them, health and disease consist: that the mercury, in proportion to its volatility, produces tremors, mortifications in the ligaments, madness, phrensy, and delirium, and that fevers, phlegmons, and the jaundice, are the offspring of the *sulphureous* principle, while he supposed that the cholic, stone, gravel, gout, and sciatica derive their origin from *salt*.

Chemistry at this period* took possession of the schools, and whilst it was gradually grafted into the theory of medicine, it soon became the only guide to its practice, the absurdity of which has been already dwelt upon.

In tracing the march of chemical improvement during the last century, we cannot but be struck with the new and powerful remedies which it has introduced, and the many unimportant and feeble articles which it has dismissed from medical practice.

In the present century, the rapid progress of Chemistry has outstripped the anticipations of its most sanguine votaries; and even in the department of vegetable analysis, a correctness has been attained, the very attempt at which had been abandoned by the most illustrious chemists of the former age as hopeless and chimerical; let us for instance only compare the results obtained by the Academicians of Paris, and published by Geoffroy, in their analyses of several hundred plants by the operation of heat, with the elegant and satisfactory researches in this branch of science lately conducted in the same country; whilst the former failed in establishing any distinction between the most inert and the most poisonous plants, the latter have succeeded in detecting, separating, and concentrating several of their more subtile constituents. *Opium* has been at length compelled to confess its secret source of action, and *Ipecacuan* to yield its emetic element in a state of perfect purity.

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* In the year 1644 Schroeder published a *Chemico*-medical Pharmacopœia, which delineates with accuracy the pharmacy of these times, and enumerates almost all the chemical medicines that were known towards the close of this period.

Our Pharmacopœias and Dispensatories* have cautiously kept pace with the scientific progress of the age; and in tracing them from their origin to the present time† it is gratifying to observe the gradual influence of knowledge in reducing the number of their articles—simplifying the composition of their formulæ—and improving the processes for their preparation.‡ Chemistry has also been the means of establishing the identity of many bodies which were long considered specifically different; thus an extensive list of animal substances has been discarded, since it is known that they owe their properties to one and the same common principle, as to *gelatine*, *albumen*, *carbonate of lime*, &c.; so again the fixed alkaline salt produced by the incineration of different vegetables, has been found to be potass, from whatever plant it may have been obtained, with the exception of sea plants, and perhaps some of the Tetradynamia, the former of which yield *Soda* and the latter *Ammonia*. Previous to the Pharmacopœia of 1745, every vegetable was supposed to yield a salt essentially different, and therefore a number of alkaline preparations were recommended, each bearing the name of the particular plant from which it had been procured, as salt of *Wormwood*—salt of *Broom*, &c.

But from the very nature and object of a Pharmacopœia, it cannot be supposed to proceed *pari passu* with the march of chemical science, indeed it would be dangerous that it should, for a chemical theory must receive the seal and stamp of experience before it can become current: a Pharmacopœia however, is always an object of abuse, because it is a national work of authority, which is quite a sufficient reason why the ignorant and conceited should question its title to respect, and its claims to utility. "*Plures audivi,*" says Huxham, "*totas blaterantes Pharmacopœias, qui tamen ne intellexerint quidem quid vel ipse pulsus significabat.*"

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* The Dispensatories of London and Edinburgh, the former by Mr. A. T. Thomson, and the latter by Dr Duncan, are works which reflect credit on the age and country in which they were written.

† The first Pharmacopœia was published at Nuremburgh, under the sanction of its Senate, in the year 1542; for this important act we are indebted to Valerius Cordus, a young student, who during a transient visit at that place, accidentally produced a collection of medical receipts which he had selected from the works of the most esteemed writers, and with which the physicians of Nuremburgh were so highly pleased that they urged him to print it for the benefit of apothecaries, and obtained the sanction of the Senate to the undertaking: so casual was the circumstance to which we owe the institution of Pharmacopœias. The London College were among the last to frame a standard Code of Medicines; most cities in Europe having anticipated us in the performance of this task: our first Pharmacopœia was not published until the reign of James the first, A.D. 1618, exactly a century after the College had received their Charter from Henry. Successive editions appeared in the following years, viz. in 1627; 1632; 1639; 1650; 1677; 1721; 1745; 1787; 1809.

‡ What would be the surprise and gratification of the Pharmaceutist who lived a hundred years ago, if he could now visit Apothecaries Hall? the application of steam for the various purposes of pharmacy, and for actuating machinery, for levigation, trituration, and other mechanical purposes, is no less useful, in ensuring uniform results, than it is in abridging labour and economizing time. The greatest credit is due to the gentlemen under whose guidance this national laboratory is conducted, and more especially to their worthy and public-spirited Treasurer, Wiliam Simons, Esq. whose zeal and liberality suggested and promoted the fitting up of the Steam Laboratory, as well as the ingenious machine for triturating mercury with lard, or conserve.

It is very evident that the greater number of these attacks has not been levelled with any view to elicit truth, or to advance science, but to excite public attention, and to provoke unfair discussion for individual and unworthy advantage; their obscure and presumptuous authors vainly hope that they may gain for their ephemeral writings some share of importance, and for themselves some degree of reputation, if they can only obtain notoriety by provoking a discussion with the College, or with some of its responsible members, though such a combat should be sure to terminate in their defeat. Like the Scythian Abaris, who upon being wounded by Apollo, plucked the arrow from his side, and heedless of the pain and disgrace of his wound, exclaimed in triumph that the weapon would in future enable him to deliver oracles.

It is not to such persons that the observations which are contained in this work are addressed, for with them I am most anxious to avoid a contest, in which, as a worthy Fellow of our College expresses it, "*Victory itself must be disgraceful.*"

When, however, we are assailed upon every occasion by a gentleman whose talents entitle him to respect, and whose public situation commands notice, I apprehend that an humble individual like myself, may, in the conscientious discharge of a public duty, deliver his sentiments from the chair to which he has been called by his professional brethren, without any risk of compromising the dignity of the College, or of drawing upon himself the charge of an unnecessary and injudicious interference.

The attack to which I chiefly allude, is contained in an historical preface by Mr. Professor Brande, to the *Supplement of the Fourth and Fifth Editions of the Encyclopædia Britannica:* in which, speaking of the writings of BOERHAAVE, he says, "The observations which he has made upon the usefulness of Chemistry, and of its necessity to the medical practitioner, may be well enforced at the present day; for, except in the schools of London and Edinburgh, Chemistry, as a branch of education, is either entirely neglected, or, what is perhaps worse, superficially, and imperfectly taught; this is especially the case in the English Universities, and the London Pharmacopœia is a record of the want of chemical knowledge, where it is most imperiously required.

The learned Professor of Oxford, Dr. Kidd, naturally anxious to repel a charge which he considered individually unfair, and to vindicate his University from an aspersion which he felt to be generally unjust, published an animated, but at the same time, a cool and candid defence, to which I have much pleasure in referring you. With respect to the Sister University, my own *Alma Mater*, I feel that I should be the most ungrateful of her sons, were I, upon this occasion, to omit expressing similar sentiments with respect to the course of Chemistry, and that of its collateral branches, which are annually delivered in the crowded schools at Cambridge. Is Mr. Brande acquainted with the discipline of our University?—Is he aware that the chemical chair has been successively filled by BISHOP WATSON —MILNER—WOLLASTON—and the late lamented Mr. TENNANT? — "*Master Builders in the Science.*" To say that such men have been the lecturers, is surely a sufficient testimony to show that the science of chemistry heretofore *could not* "have been neglected, or what perhaps is still worse, imperfectly taught;" and the zeal and ability displayed by the present Professor ought to have shielded him from any such attack. Is Mr. Brande aware that the eloquent appeal of BISHOP WATSON from the chair at Cambridge,* on the general importance and utility of chemistry, gave the first impulse to that public taste for this science which so eminently distinguishes our Augustan age, and which has been the means of founding and supporting the Royal and other Public Institutions in this Metropolis, as well as in the other towns of the British Empire?

I need make no farther remark upon this part of Mr. Brande's assertion; the sequel, judging from the construction of the sentence, is evidently intended to be understood as a consequence, viz. and *therefore* "the London Pharmacopœia is a record of the want of chemical knowledge where it is most imperiously required," *because Oxford and Cambridge physicians were its Editors.* Is not this the obvious construction?

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* The Chemical Laboratory at Cambridge has produced some valuable discoveries. *Ex pede Herculem*, let me remind the chemist of the formation of Nitrous Acid, by passing a current of ammoniacal gas through the heated Oxyd of Manganese, for which we are indebted to Dr. Milner. I mention it merely as a whimsical circumstance, that the greatest degree of cold ever produced, was effected at Oxford, and the highest temperature, lately at Cambridge. The researches of Dr. Clarke are highly interesting and important, a succinct account of them has been published by him in a small work, entitled "The Gas Blowpipe, or the Art of Fusion, by burning the Gaseous constituents of Water."

It appears from Mr. Brande's laconic answer to Dr. Young, published in "*The Journal of Science and the Arts*," that his objections are those of Mr. Phillips, contained in his experimental examination of the Pharmacopœia; a work which, I confess, appears to me to furnish a testimony of the experimental tact, subtle ingenuity, and caustic style of criticism, which its author so eminently possesses, rather than a proof of any fatal or material inaccuracy in the Pharmacopœia; and I may urge this with greater force and propriety, when it is considered that at the time of its publication I was not a Fellow of the College, and therefore had no voice upon the subject of its composition, and consequently must be *personally* disinterested in its reputation.

I cannot conclude these observations upon Mr. Brande's attack, without expressing a deep feeling of regret, that a gentleman, whose deserved rank in society, and whose talents and acquirements must entitle him to our respect, should have condescended to countenance and encourage that vile and wretched taste of depreciating the value and importance of our most venerable institutions, and of bringing into contempt those acknowledged authorities which must always meet with the approbation of the best, and the sanction and support of the wisest portion of mankind.

And I shall here protest against the prevailing fashion of examining and deciding upon the pretensions of every medicinal compound to our confidence, by a *mere chemical* investigation of its composition, and of rejecting, as fallacious, every medical testimony which may appear contradictory to the results of the Laboratory; there is no subject in science to which the maxim of Cicero more strictly applies, than the present case; let the *Ultra* Chemist therefore cherish it in his remembrance, and profit by its application—PRÆSTAT NATURÆ VOCE DOCERI, QUAM INGENIO SUO SAPERE."

Has not experience fully established the value of many medicinal combinations, which, at the time of their adoption could not receive the sanction of any chemical law? We well remember the opposition, which on this ground was for a long time offered to the introduction of the *Anti-hectic Mixture* of Dr. Griffith—the *Mistura Ferri Composita* of the present Pharmacopœia, and yet subsequent inquiry has confirmed upon scientific principles the justness of our former practical conclusion; for it has been shown that the chemical decompositions which constituted the objection to its use, are in fact the causes of its utility (*see Mist. Ferri,*) the explanation, moreover, has thrown additional light upon the theory of other preparations; so true is the observation of the celebrated Morveau, that "*We never profit more than by those unexpected results of Experiments, which contradict our Analogies and preconceived Theories.*"

Whenever a medicine is found by experience to be effectual, the practitioner should listen with great circumspection to any *chemical* advice for its correction or improvement. From a mistaken notion of this kind the *Extractum Colocynthidis compositum*, with a view of making it chemically compatible with *Calomel*, has been deprived of the *Soap* which formerly entered into its composition, in consequence of which its solubility in the stomach is considerably modified, its activity is therefore impaired, and its mildness diminished.

On the other hand, substances may be medically inconsistent which are chemically compatible, as I shall have frequent opportunities of exemplifying. The stomach has a chemical code of its own, by which the usual affinities of bodies are frequently modified, often suspended, and sometimes entirely subverted; this truth is illustrated in a very striking manner by the interesting experiments of M. Drouard, who found that Copper, swallowed in its metallic state, was not rendered poisonous by meeting with oils, or fatty bodies; nor even with *Vinegar*, in the digestive organs. Other bodies, on the contrary, seem to possess the same habitudes in the stomach as in the laboratory, and are alike influenced in both situations by the chemical action of various bodies, many examples of which are to be found under the consideration of the influence which solubility exerts upon the medicinal activity of substances; so again, acidity in the stomach is neutralized by *Alkalies*, and if a *Carbonate* be employed for that purpose, we have a copious disengagement of *arbonic acid gas*, which has been frequently very distressing; lastly, many bodies taken into the stomach undergo decompositions and changes *in transitu*, independent of any play of chemical affinities from the hidden powers of digestion, some of which we are enabled to appreciate, and they will accordingly form a subject of investigation in the course of the present work.

The powers of the stomach would seem to consist in decomposing the *Ingesta*, and reducing them into simpler forms, rather than in complicating them, by favouring new combinations.

But every rational physician must feel in its full force, the absurdity of expecting to account for the phænomena of life upon principles deduced from the analogies of inert matter, and we therefore find that the most intelligent physiologists of modern times have been anxious to discourage the attempt, and to deprecate its folly. Sir Gilbert Blane, in his luminous work on MEDICAL LOGIC, when speaking of the different theories of digestion, tells us that Dr. William Hunter, whose peculiar sagacity and precision of mind detected at a glance the hollowness of such delusive hypotheses, and saw the danger which theorists run in trusting themselves on such slippery ground, expressed himself in his public lectures, with that solidity of judgment combined with facetiousness of expression, which rendered him unparalleled as a public teacher. "Gentlemen," said he, "Physiologists will have it that the stomach is a mill —others, that it is a fermenting vat—others again, that it is a stew-pan,—but in my view of the matter, it is neither a mill, a fermenting vat, nor a stew-pan—but a STOMACH, Gentlemen, a STOMACH."

What can illustrate in a more familiar and striking manner the singular powers of *Gastric Chemistry*, than the fact of the shortness of time in which the aliment becomes acid in depraved digestion? A series of changes is thus produced in a few hours, which would require in the laboratory as many weeks,* while in acute affections of the alimentary canal the functions of the stomach are nearly suspended, and hence, under such circumstances, whatever is introduced into this organ remains unchanged, even the nutritious mucilages are not digested.

From what has been said, it is very evident that the mere chemist can have no pretensions to the art of composing or discriminating remedies; whenever he arraigns the scientific propriety of our prescriptions, in direct contradiction to the deductions of true medical experience,—whenever he forsakes his laboratory for the bed-side, he forfeits all his claims to our respect, and his title to our confidence. It is amusing to see the ridiculous errors into which the chemist falls, when he turns physician; as soon as Seguin found that Peruvian bark contained a peculiar principle that precipitated *Tannin*, he immediately concluded that this *could not be any other* than *Gelatine*, and upon the faith of this blunder, the French, Italian, and German physicians,† gave their patients nothing but *Clarified Glue*, in intermittent fevers! But I desist—not, however, without expressing a hope, in which I am sure my medical brethren will concur, that should Mr. Brande again condescend to favour us with a commentary upon Boerhaave, he will select that passage in his work, where, alluding to the application of Chemistry to Physic, he emphatically exclaims, "EGREGIA ILLIUS ANCILLA EST, NON ALIA PEJOR DOMINA."

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* The only chemical phenomenon which in any manner resembles this, appears to be that of the rapid acetification of milk, and other fluids, by the agency of a thunder storm.

† This practice was introduced into France by Seguin, into Italy by Coutiсiri, and into Germany by Bischoff.

THE INFLUENCE OF SOIL, CULTURE, CLIMATE, AND SEASON.

The facts hitherto collected upon this subject are so scanty and unsatisfactory, that I introduce its consideration in this place, rather with a wish to excite farther inquiry, than with any hope of imparting much additional information.

There can be little doubt, but that Soil, Culture, Climate, and Season may very materially influence the active properties of a medicinal plant; while the two latter of these causes may as essentially change the type and character of a disease, and modify the vital susceptibility of the patient: this must be admitted to its full extent, or it will be extremely difficult to explain the contradictory, and even opposite opinions, and to reconcile the conflicting testimonies of the physicians of different countries, with respect to the efficacy of the same remedy in similar diseases.

THE INFLUENCE OF SOIL may be exemplified by many well-known facts; thus, strongly smelling flowers lose their odour in a sandy soil, and do not again recover it by transplantation into a richer one; a fact upon which Rozier founded his proposal for the improvement of rape oil; so again, no management could induce the *Ricotia Egyptiaca* to flower, until Linnæus suggested the expediency of mixing clay with the earth in the pot; *Assafœtida* is one of those plants that vary much according to station and soil, not only in the shape of the leaves, but in the peculiar nauseous quality of the juice which impregnates them, and Dr. Woodville states that it is frequently so modified that the leaves are eaten by goats: Gmelin informs us, on the authority of Steller, that the effects of the *Rhododendron* have been found to vary very materially according to the "*solum natale;*" for example, that produced in a certain spot has proved uniformly *narcotic*, that in another *cathartic*, while a sense of suffocation has been the only symptom occasioned by a third.*

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* A very ingenious Dissertation has been lately published by M. Virey, on the "Degeneration of Plants in foreign soils," which he says may depend upon, 1, Climate and Station; 2, Nutriment; 3, Culture; 4, Factitious Mutilation; 5, Hybrid Generation.

Climate also produces a powerful impression upon vegetable and animal life. It is probable that in southern countries some vegetables enjoy more energetic properties than in northern climes. The history of opium immediately countenances such an opinion; thus Egypt produces a stronger *opium* than any of the countries on the north side of the Mediterranean,—France, than England or Germany;—and Languedoc, than the northern parts of France;—while Smyrna, Natolia, Aleppo, and Apulia, furnish a juice far more narcotic than Languedoc: so again, *Senna* by transplantation from Arabia into the south of France (Provence) assumes a marked change in its physiognomy and virtues, its leaves are more obtuse, and its taste less bitter and nauseous than the pointed leaved variety, while its effects will be found to be less purgative. *Cruciform* plants degenerate within the tropics, but acquire increased energies, as *Antiscorbutics*, in cold regions; the *Menthæ* have not so penetrating an essential oil in the south of Europe as in England and in the north of France. The relative proportions of gluten vary in the wheat of different countries, and as in the south of Europe its quantity greatly predominates over the other principles, we at once discover the cause that gives such excellence to the Maccaroni of Italy. The influence of climate, in its relations to moisture and dryness, upon vegetable productions, is also worthy of investigation; in wet and cold seasons, our herbage is far less nutritive to cattle, and we accordingly find that they are constantly grazing, in order to compensate by quantity, for what is deficient in quality, whereas in dry seasons, a larger proportion of their time is consumed in rumination: the same causes, however, that diminish the nutritive powers of plants, frequently increase the energy of those principles upon which their medicinal value depends; it is obvious that many herbs are more rank and virulent in wet and gloomy seasons: this would appear to be a wise and provident law, in order to apportion the natural condiment of the vegetable, to the deteriorated state of its nutritive elements, when the digestive organs must require more than the ordinary stimulus for the due exercise of their functions. It is hardly necessary to observe that plants, which in temperate climates are merely shrubs, have been developed into trees by the hot and humid plains of Africa and Asia; while in the arid deserts of Nubia, or in the frigid plains of Siberia, vegetable life is confined to stunted shrubs and humble mosses: cold also suppresses the colour of flowers, and indeed even that of the leaves, as is witnessed in the *Cyclamen*, *Amaranthus*, and *Ranunculus* of Lapland and Siberia. But climate not only modifies the powers of a remedy by influencing its structure and composition, but it renders it more or less active, by increasing or diminishing the susceptibility of the body to its impression; can a more striking proof of this fact be adduced than the well-known effects of perfumes at Rome? The inhabitants are unable to sustain the strong scent of flowers in that climate, without experiencing a sensation highly oppressive, and which in some cases is even succeeded by syncope,* and thus realizing the well-known line of the poet,

"Die of a Rose, in aromatic pain."

As I have been favoured with some very interesting observations upon this subject by my friend Dr. Harrison, who resided for a considerable time in Italy, and was thus enabled to institute a satisfactory inquiry into this curious subject, I feel no hesitation in introducing a quotation from his letter to my readers.—"You ask me what experience I have had on the subject of climate, as affecting the powers and operation of remedies; I have no difficulty in asserting that Narcotics act with greater force even in smaller doses at Naples, where I had the advantages of much experience, than in England. I might adduce as an example the *Extract of Hyoscyamus*, which, when given to the extent of three grains thrice a day, produced in two patients a temporary amaurosis, which disappeared and again recurred on the alternate suspension and administration of this medicine; and it deserves particular notice that these very patients had been in the habit of taking similar doses of the same remedy in England, without any unpleasant result. Now that this depended upon an increased susceptibility of the patient, in the warmer climate, rather than an increased power in the remedy, is unquestionable, since the extract which was administered in Italy had been procured from London; indeed a high state of nervous irritation is the prevalent disorder of Naples. I treated several cases of Epilepsy in Italy with the *nitrate of silver*, and with complete success, while in England I have certainly not met with the same successful results. During my residence at Naples, I spent some time in the island of Ischia, so celebrated all over the continent for its baths; many of the patients who were then trying their efficacy, had been attacked with Paralysis, Apoplexy, and almost every degree of loss of mental and muscular power and among them I certainly witnessed what with propriety might be denominated a genuine case of *Nervous Apoplexy*. These complaints I was generally able to trace to the abuse of *Mercury*, whence we may, I think, very fairly conclude that this metal is more active in its effects, than in our own country. Before I quit this subject, I ought to mention that the doses of medicines, as seen in the prescriptions and works of English Physicians, excite universal astonishment among the faculty of Italy. In fact, as I have just stated, the human constitution in this part of the continent is certainly much more susceptible of nervous impression than in England: it is perfectly true that flowers or perfumes in a chamber, will frequently produce syncope in persons apparently strong and healthy, and the fact is so universally admitted, that the Italians avoid them with the greatest caution." On the other hand, it certainly appears equally evident that some remedies succeed in cold climates which produce little or no benefit in warmer latitudes. Soon after the publication of the first edition of my Pharmacologia, I received a letter from Dr. Halliday of Moscow, upon the subject of the "*Eau Medicinale*," and as it offers a striking proof of the efficacy of the *Rhododendron Chrysanthum* in curing the rheumatism of the North, whilst in this country the plant has been repeatedly tried without any signal proof of success, I shall here subjoin an extract from the letter of my correspondent: "In reading your account of the '*Eau Medicinale*,' I perceived that, upon the authority of Mr. James Moore, you state it to be a preparation of the *White Hellebore*; may I be allowed to suggest the probability of its being made from the leaves of the *Rhododendron Chrysanthum?* for so far as I can learn, the effects of the French medicine are precisely those which are experienced from an infusion of the above plant, which the Siberians and Russians regard as an infallible specific in the cure of chronic rheumatism and gout, and from which I myself, as well as other physicians in Russia, have witnessed the most desirable and decided effects, whenever we had it in our power to administer the remedy with confidence and courage. We have seldom given it in any other form or dose than that adopted by the Siberians themselves, which is to infuse in a warm place, generally near a furnace and during the night, two drachms of the fresh leaves in about twelve ounces of boiling water, taking care that the liquid never boils. This dose is to be taken in the morning upon an empty stomach, and during its nauseating operation, which generally commences in about a quarter of an hour after it has been swallowed, neither solids nor liquids of any description are allowed; after an interval of three or four hours, I have seen the patient obtain a copious and black fœtid stool, and get up free from all pain. Should it happen that the patient does not recover from the first dose, another is administered on the succeeding day, and I have known it to be taken for three days in succession, when the severest fits of gout have been removed.* Is it not then probable that some cunning Frenchman has availed himself of this Siberian specific, and concentrated it in such a form, as to defy all the learned to find it out?"

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* Women during the period of gestation frequently experience such an increased irritability as to be affected even in England by various odours, which at other times would produce no extraordinary impression.

Dr. Halliday adds, "The Siberians denominate the leaves of this plant, when infused in water, *Intoxicating Tea;* and a weaker infusion is in daily use, especially for treating their neighbours, just as the Europeans do with tea from China."

But of all circumstances that produce the greatest change in the aspect as well as in the virtues of the vegetable creation, is CULTIVATION, which may either destroy the medicinal properties of a plant, or raise in it new and most valuable qualities: cultivation converts single into double flowers, by developing the stamens into petals, a change which in many cases destroys their efficacy, as in the chamomile, *Anthemis Nobilis;* for, since all the virtues of this flower reside in the disc florets, it is of course greatly deteriorated by being converted into the double-flowered variety; by the operation of *grafting* extraordinary changes may also be produced; Olivier, in his travels, informs us that a soft *Mastiche*, having all the qualities of that resin, except its consistence, which is that of turpentine, is procured by engrafting the Lentisk on the Chian Turpentine-tree.

Buffon states that our wheat is a factitious production raised to its present condition by the art of agriculture. M. Virey† observes, that by suppressing the growth of one part of a plant we may respectively give rise to an increased developement in others; thus are some vegetables rendered eunuchs, or are deprived of seeds by obliteration, and only propagate themselves by slips; such a condition is frequently produced by culture, continued through a long succession of generations; this is the case with the *Banana*, *Sugar Cane*. and other fruits that have carefully been made to deviate for a long series of years from their original types, and having been continually transplanted by slips, suckers, or roots, at length only propagate themselves in this way, whereby the roots, as those of the common potato, become inordinately developed, drawing to themselves the succulence and nutrition originally possessed by the berries. It seems probable that we may thus have lost many vegetable species; the *Tuberes* of Pliny, for example, are suposed by Mr. Andrew Knight to have been intermediate productions, formed during the advancement of the Almond to the Peach, or in other words that they were swollen almonds or imperfect peaches; if this conjecture be admitted, it will explain the fact stated by Columella, that the peach possessed deleterious qualities when it was first introduced from Persia into the Roman Empire. If there be any who feel sceptical upon the subject of such metamorphoses, let him visit the fairy bowers of Horticulture, and he will there perceive that her magic wand has not only converted the tough, coriaceous covering of the almond into the soft and melting flesh of the peach, but that by her spells the sour Sloe has ripened into the delicious Plum, and the austere Crab of our woods into the Golden Pippin; that this again has been made to sport in endless variety, emulating in beauty of form and colour, in exuberance of fertility, and in richness of flavour, the rarer productions of warmer regions and more propitious climates! In our culinary vegetables the same progressive amelioration and advancement may be traced; thus has the acrid and disagreeable *Apium graveolens* been changed into delicious *Celery*, and the common *Colewort*, by culture continued through many ages, appears under the improved and more useful forms of Cabbage, Savoy, and Cauliflower. It has been already observed that the alimentary and medicinal virtues are frequently in opposition to each other, and that while cultivation improves the former, it equally diminishes the latter; I shall have occasion to offer some additional facts upon this curious subject, under the consideration of *Bitter, Extractive; see Note, at p.* 108.

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* This plant was first described by Gmelin in his *Flora Siberica*, iv. 121. It has obtained a place in the Edinburgh Pharmacopœia. Besides the effects stated by Dr. Halliday, it is said by different authors to excite a peculiar creeping sensation in the pained part.

† Journal Complementaire du Dict. des Sciences Medicales, tom. II.

THE IGNORANT PREPARATION AND FRAUDULENT ADULTERATION OF MEDICINES.

The circumstances comprehended under this head certainly deserve to be ranked among the more powerful causes, which have operated in affecting the reputation of many medicinal substances. The Peruvian Bark fell into total discredit in the year 1779, from its inability to cure the ague; and it was afterward discovered to have been adulterated with bark of an inferior species; indeed Sydenham speaks of the adulteration of this substance before the year 1678; he tells us that he had never used to exceed two drachms of *Cinchona* in the cure of any intermittent, but that of late the drug was so inert, rotten, and adulterated, it became necessary to increase its dose to one, two, or three ounces. The subject is copious, and full of importance, and I have taken considerable pains to collect very fully the various modes in which our remedies are thus deprived of their most valuable properties, and to suggest the best tests by which such frauds may be discovered. Very few practitioners have an idea of the alarming extent to which this nefarious practice is carried, or of the systematic manner in which it is conducted: there can be no doubt but that the sophistication of medicines has been practised in degree in all ages,* but the refinements of chemistry have enabled the manufacturers of the present day not only to execute these frauds with greater address, but unfortunately at the same time to vend them with less chance of detection. It will be scarcely credited, when I affirm that many hundred persons are supported in this metropolis by the art of adulterating drugs, besides a number of women and children who find ample employment and excellent profit in *counterfeiting* Cochineal with coloured dough, Isinglass with pieces of bladder and the dried skin of soles, and by filling up with powdered Sassafras the holes which are bored in spice and nutmegs, for the purpose of plundering their essential oils.

THE UNSEASONABLE COLLECTION OF VEGETABLE REMEDIES.

Vegetable physiology has demonstrated, that during the progress of vegetation most remarkable changes occur in succession, in the chemical composition, as well as in the sensible qualities of a plant; time will not allow me to be prodigal of examples, take therefore one which is familiar and striking,—the aromatic and spicy qualities of the unexpanded flowers of the *Caryophyllus Aromaticus* (*Cloves*) are well known to every body, but if the flower-bud be fully developed it loses these properties altogether, and the fruit of the tree is not in the least degree aromatic; so the berries of Pimento, when they come to full maturity, lose their aromatic warmth, and acquire a flavour very analogous to that of Juniper. The *Colchicum autumnale* may be cited as another example in which the medicinal properties of the vegetable are entirely changed during the natural progress of its developement. See also *Inspissated Juices*, under the article *Extract*.

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* Dr. Murett in his "Short view of Frauds and Abuses," (A.D. 1669) charges the Apothecary with "falsifying Medicines;" "They showed Censors," says he, "Myrtles leaves for Senna; a Binder for a Purger; Mushrooms rubbed over with chalk for Agaric; Hemlock for Pœony; Sheep's lungs for Fox's lungs; and the bone of an Ox's heart, for that of a Stag's heart."

THE OBSCURITY WHICH HAS ATTENDED THE OPERATION OF COMPOUND MEDICINES.

It is evident that the fallacies to which our observations and experience are liable with respect to the efficacy of certain bodies, as remedies, must be necessarily multiplied when such bodies are exhibited in a state of complicated combination, since it must be always difficult, and often impossible, to ascertain to which ingredient the effects produced ought to be attributed.

How many frivolous substances have from this cause alone gained a share of credit, which belonged exclusively to the medicines with which they happened to be accidentally administered?* Numerous are the examples which I might adduce in proof of this assertion; the history of Bezoar† would in itself furnish a mass of striking evidence; indeed the reputation of this absurd substance was maintained much longer than it otherwise would have been, by its exhibition having been frequently accompanied with that of more active articles. Monardes for instance extols the efficacy of the *Bezoar* as a vermifuge, but he states that it should be mixed with the seeds of *Wormwood*. Besides, in the exuberance of mixture, certain reactions and important changes are mutually produced, by which the identity of the original ingredients is destroyed; but this subject will be introduced for discussion in the first part of the Pharmacologia.

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* The editors of the *American Medical Recorder*, (vol. I. p. 471,) in descanting upon the efficacy of Prussic acid, very gravely remark, that they are acquainted with a lady, subject to hysteric affections, who *always* derives relief from a dose of CHERRY BRANDY, in which *Peach kernels* have been digested; the stimulus of the brandy then goes for nothing with these blockheads! Zimmerman not unaptly compares a man who is intoxicated with a favourite opinion, to a passionate lover, who sees and hears nothing but his mistress.

† BEZOAR, (from *Pa-zahar*, Persian. a destroyer of poison.) A morbid concretion formed in the bodies of land-animals. Several of them were formerly highly celebrated for their medicinal virtues; they were considered as powerful *Alexipharmics*, insomuch so, that other medicines, possessed of alexipharmic powers, were called *Bezoardics*: so efficacious were the substances formerly considered that they were bought for ten times their weight of gold. A composition of Bezoar with absorbent powders, has been extensively used under the name of *Gascoigne* powder, and *Gascoigne's Ball*; but the real bezoar was rarely used on this occasion, Gypsum, or pipe-clay tinged with ox-gall, proved a less expensive ingredient.

The practice of mixing together different medicinal substances, so as to form one remedy, may boast of very ancient origin, for most of the prescriptions which have descended from the Greek physicians are of this description; the uncertain and vague results of such a practice appear also to have been early felt and often condemned, and even Erasistratus declaimed with great warmth against the complicated medicines which were administered in his time; the greater number of these compositions present a mass of incongruous materials, put together without any apparent order or intention; indeed it would almost appear as if they regarded a medical formula as a problem in *Permutation*, the only object of which was to discover and assign the number of changes that can be made in any given number of things, all different from each other.

At the same time it must in justice be allowed, that some of the earlier physicians entertained just notions with regard to the use and abuse of combination, although their knowledge of the subject was of course extremely limited and imperfect.

ORIBASIUS* recommends in high terms certain combinations of *Evacuant* and *Roborant* medicines, and the remarks of ALEXANDER TRALLIANUS on a remedy which he exhibited in paralysis, serve to show that he was well acquainted with the fact, that certain substances lose their efficacy when they stimulate the bowels to excess, for he cautions us against adding a greater proportion of *Scammony* to it; many, he observes, think that by so doing, they increase the force of the medicine, whereas in fact they make it *useless*, by carrying it immediately through the bowels, instead of suffering it to remain and be conveyed to the remote parts.

In modern Europe, the same attachment to luxuriancy of composition has been transmitted to our own times: there are several prescriptions of Huxham extant which contain more than *four hundred* ingredients. I have already observed that all extravagant systems tend, in the course of time, to introduce practices of an opposite kind; this truth finds another powerful illustration in the history of medicinal combination, and it becomes a serious question, which it will be my duty to discuss, whether the disgust so justly excited by the *poly-phar-*

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* ORIBASIUS, a native of Sardes, lived in the fourth century; he was the friend and favourite of the Emperor Julian, under whom he had great authority, and acquired considerable wealth. It would be well for the profession of physic if crowned heads generally evinced as much discrimination in the appointment and patronage of physicians.

macy of our predecessors, may not have induced the physician of the present day to carry his ideas of simplicity *too far*, so as to neglect and lose the advantages which in many cases beyond all doubt may be obtained by scientific combinations.

In the year 1799, Dr. FORDYCE, in a valuable paper published in the second volume of the Transactions of the Medical Society, has investigated this subject with much perspicuity and success: unfortunately, however, this memoir terminates with the investigation of *similar* remedies, that is to say, of those which produce upon the body similar effects, and he is entirely silent upon the advantages which may be obtained by the combination of those medicines which possess *different*, or even *opposite* qualities; it must be also remembered that at the time this memoir was composed by its eminent author, Chemistry had scarcely extended its illuminating rays into the recesses of physic. Under such circumstances, I am induced to undertake the arduous task of inquiring into the several relations in which each article of a compound formula may be advantageously situated with respect to the others; and I am farther encouraged in this investigation, by a conviction of its great practical importance, as well as by feeling that it has hitherto never received the share of attention which it merits. "I think," says Dr. Powell, "it may be asserted, without fear of contradiction, that no medicine compounded of five or six simple articles, has hitherto had its powers examined in a rational manner." If this attempt should be the means of directing the attention of future practitioners to the subject, and thereby of rendering the Art of Composition more efficient, by placing it upon the permanent basis of science, I shall feel that I have profitably devoted my time and attention to the most useful of all medical subjects. "*Res est maximi momenti in arte medendi, cum, Formula in se considerata, possit esse profecto mortis vel vitæ sententia.*"

PHARMACOLOGIA.

ON THE

OPERATIONS OF MEDICINAL BODIES,

AND ON THE

CLASSIFICATIONS FOUNDED ON THEM.

> " *Medicos tandem tædet et pudet, diutius garrire de Remediis, Specificis, et Alexipharmicis, et cæteris, nisi eorum naturam et modum quo prosint, quodammodo ostendere et explanare possint.*"
>
> Conspect. Med. Theor.

PHARMACOLOGIA.

ON THE

OPERATIONS OF MEDICINAL BODIES,

AND ON THE

CLASSIFICATIONS FOUNDED ON THEM.

MEDICINAL Substances are those bodies, which, by due administration, are capable of producing certain changes in the condition of the living system, whereby its morbid actions may be entirely removed, or advantageously controlled.

In adopting this definition we intentionally exclude those alimentary substances which are more immediately subservient to the support of life, and to the repair of that diurnal waste, which the exercise of its functions so inevitably occasions.

It has been generally supposed, that substances whose application does not produce any sensible action upon the healthy system, cannot possess medicinal energy; and, on the contrary, that those bodies which occasion an apparent effect in health, must necessarily prove active in the cure or palliation of disease. Under certain limitations we may perhaps venture to assent to this general proposition; but it cannot be too forcibly or too frequently impressed upon the mind of the medical practitioner, that *Medicines are frequently but relative agents*, producing their effects in reference only to the state of the living frame; we must therefore concur with Sir Gilbert Blane in stating, that the virtues of Medicines cannot be fairly essayed, nor beneficially ascertained, by trying their effects on sound subjects, because that particular morbid condition does not exist which they may be exclusively calculated to remove;* thus in certain states of debility, *Tonics* may excite the system when languid, by their sympathetic influence upon the *primæ*

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* Medical Logic. Edit. 2d. p. 92.

viæ, while in a robust condition of the body, the effects of the same agents may be wholly inappreciable.

The MODUS OPERANDI of remedies, or the general principle upon which they effect salutary changes in the morbid states of the body, is involved in considerable obscurity, and has given rise to much ingenious speculation and scientific controversy. It would seem that the immediate impression of a remedy may depend upon mechanical, chemical, or vital agencies; and that the sanative impulse thus occasioned may either be Absolute or Relative;—Primary or Secondary; Local or General; Direct or Sympathetic; Permanent or Transient; thus certain purgatives will occasion intestinal excretions in every condition of the body, and may therefore be justly considered as being *absolute* agents; while diuretics, since they generally require for their success, a certain state of the living system, may with equal truth be denominated *relative* in their operation. That the obvious effect of a remedy may either depend upon its *Primary*, or *Secondary* and incidental operation, will at once be apparent by inspecting the diagram which exhibits the classification of diuretic medicines; the same scheme will also show that remedies may be *local* or *general* in their effects, and may excite an action in distant organs, either by entering the circulating mass, and being thus brought into contact with their textures; by occasioning an impulse conveyed through the nervous system, or by exciting a local impression upon the stomach and *primæ viæ*, and thus arousing their energies through the mysterious medium of sympathetic* communication. That certain bodies are capable of evading the assimilating functions, and of entering, unchanged, into the circulating current, either through the branches of the thoracic duct, or of the *vena portarum*, is a fact which admits of chemical demonstration; many of the alkaline salts are thus conveyed to the kidneys, and being excreted from the blood by its vessels, are to be easily detected in the urine by appropriate reagents; I have made many experiments upon this subject, and am prepared to state some results which may perhaps explain the occasional value of such bodies as medicines. Some essential oils, particular *bitter* principles,[*] and certain colouring matter,[†] seem also capable of passing the barriers of digestion, and of circulating to the remote parts of the body; Mercury, and several of the other metals, would likewise appear, under certain circumstances, to possess a similar privilege, and the former to be able moreover to facilitate the absorption of other bodies with which it may be associated, as I shall hereafter more fully exemplify.

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* The term *sympathy* has often been objected to, as being too figurative; it is certainly a metaphor taken from an affection of the mind, but, as Sir Gilbert Blane very justly remarks, the import of words ought either to be assumed conventionally according to a definition, or to be adhered to in the sense affixed to it by established usage; "by *animal sympathy*," says he, "is not meant the intelligible principle of Stahl's hypothesis, but that mutual influence of distant parts, so subtile and rapid as in some instances to be compared to thought or lightning; while in other instances it is an action more tardy and habitual." *Medical Logic. Edit.* 2d. p. 123. In the present work, I wish the reader to understand the term *sympathy*, wherever it may occur, in conformity with the above definition.

In some instances, the medicinal body undergoes a partial decomposition by the digestive organs, *in transitu*, by which some of its constituents escape into the circulation, while the others are completely digested, and converted into chyle; this occurs with saline compounds into which vegetable acids enter as constituents. See *Potassæ Acetas.* There is likewise reason to suppose, that in particular conditions of the digestive functions, a remedy may be at once rendered inert by its entire decomposition.[‡]

That an impression made upon the stomach by a medicinal agent, should be the means of exciting an action in the distant parts of the machine, will not appear extraordinary when we consider how universal a sympathy and control this central organ exercises over every function of the body; imbued with exquisite and diversified sensibilities,—subjected to the first and coarsest impressions of our various ingesta,—stretched occasionally to an enormous extent by the unrestricted indulgence of appetite,—disturbed by the passions,—exhausted by volition, and debilitated by intense thinking; in short, assailed by numerous foes from *without*, and harassed by various revolutions from *within*, can we feel surprised that the aberrations of this viscus should give origin to the greater number of maladies with which we are afflicted, or that those medicinal applications should be effective that are directed for their cure, through the medium of its sympathies?

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[*] *Colchicum*, *Squill*, and many other vegetable diuretics, are of this nature.

[†] The Indian Fig, (*Cactus Opuntia.*) when eaten, renders the urine of a bloody colour.

Rhubarb has likewise an effect upon the colour of this secretion.

[‡] This is probably the reason of many bodies producing but little effect upon the inferior animals. The vegetable eaters are certainly less affected by vegetable poisons than those animals who exclusively live upon animal substances: it is thus, that a rabbit can take a very large dose of opium without any ill effects, while half the same quantity would poison a dog. It is a curious fact, that a sound horse can take a very considerable portion of Opium with impunity, but if he be weakened by previous disease, by strong purgatives, or by excessive bleeding, he is speedily destroyed by a much less dose; (*See Bracy Clarke's Reformed Pharmacopœia for Horses.*) In this latter case, does it not appear that the fatal result depends upon the fact of the digestive organs having been disabled, by debility, from effecting that decomposition by which under ordinary circumstances, the drug is disarmed of its potency? What important lights might not be obtained by the institution of a series of well-devised experiments upon the comparative effects of medicinal bodies upon man and other animals; The Physiologist has thus availed himself of the resources of the comparative anatomist, and I feel persuaded, that results equally beneficial to science would follow a similar inquiry in relation to the operations of medicines.

In the course of the present work, I hope to show the truth of this position by some appropriate illustrations.

A dose of Ipecacuan, by exciting the stomach, will abate both the force and velocity of the heart in its vital motion, and affect the whole series of blood-vessels, from their origin to their most minute ramifications, as is evinced by the pallor of the skin under its operation, as well as by its efficacy in arresting hemorrhage; so the brain when disordered by vertigo frequently derives instantaneous relief from the administration of a teaspoonful of ether in a glass of water. The stomach, however, is not in every case the medium of sympathy; a substance may excite a powerful impression upon a distant part, by the instrumentality of the nerves, without any concurrence of the stomach; thus the *Belladonna*, by coming in contact with the *Tunica Conjunctiva* of the eye, will occasion immediate dilatation of the *Iris*, although no other part of the system is in the slightest degree affected. But there is yet another mode by which remedies may be made to exert a sanative effect upon particular organs of the body, through the medium of what Mr. Hunter called *contiguous* sympathy, and whose existence appears to depend upon the mere proximity and continuity of parts, without any relation to the distribution of the nerves; thus it is, that relief is afforded to a deep-seated inflammation, by scarifying the nearest external surface; while we know from long experience that the thoracic or abdominal viscera, when similarly affected, receive corresponding relief from the same topical use of bleeding, blistering, or fomenting.

With respect to the *Modus Operandi* of medicines, the following classification may be established.

THE PARTICULAR ORGANS OF THE BODY MAY BE EXCITED INTO ACTION, THROUGH FOUR DISTINCT AND DIFFERENT MODES OF COMMUNICATION.

I. By the actual contact of the appropriate remedy.

1. *Conveyed by absorption*, WITHOUT DECOMPOSITION.

Internally
a. through the branches of the Thoracic duct.
b. . . . . of the Vena Portarum.[*]

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[*] That the Vena Portarum constitutes one of the avenues through which certain extraneous bodies enter the circulating current, there cannot exist

Externally
c. . . . . *of divided blood-vessels.*
d. . . . . *of Lymphatics.*†

2. *Conveyed by absorption,* WITH DECOMPOSITION, *by which one or more of its constituents are developed, and pass into the circulating current.*

II. By an impulse conveyed by the instrumentality of the nerves.

III. By the sympathetic control exerted by the stomach on distant parts.

IV. By the operation of contiguous sympathy, or of that which is excited by the mere proximity and continuity of parts.

And it is important to observe, that these are frequently antagonist operations, and consequently, remedies, although they should occasion the same apparent effects, unless they act through the same medium, are not SIMILAR agents, but on the contrary are generally medicinally incompatible with each other; for an illustration of this truth, the practitioner must refer to the observations which I have offered under the history of diuretics.

The difficulty of justly appreciating these phenomena, in every instance, has furnished a powerful objection against the validity of any classification of medicinal substances which is founded on their supposed modes of operation; and it must be acknowledged that if we are unable to assign to remedies their primary action, or to distinguish this from their more obvious, though perhaps secondary effects, we shall frequently be compelled to place similar medicines under opposite heads, and to include those of very dissimilar characters under the same artificial division; an error which has contributed more generally to embarrass and misguide our practice than any other therapeutical fallacy, and it was the conviction of this truth which induced me to introduce the present chapter, and to impress the importance of its subject upon the attention of my practical readers.

It is probable, that in philosophical strictness, no two medicines in our materia medica are perfectly similar, although they recede from each other by such insensible shades of gradation

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a doubt; but a series of well-devised experiments are greatly wanted for the elucidation of the subject. The Professors of Veterinary Medicine might on this occasion render us an important service by some comparative researches.

† See *Unguent. Hydrarg.*

that we may with practical advantage admit their parallelism; at the same time, it must be ever kept in remembrance, that *those Medicines only are practically similar, whose operations have been found by experience to continue similar under every condition of the human body; and which, moreover, owe such similarity to modes of operation which are compatible with each other, and consonant with the general indications of cure.*

The importance of admitting this proposition will be frequently illustrated in the sequel; and it may be observed in this place, that every classification in which it is not recognised as a leading principle, must be as imperfect in its execution, as it will be unjust and erroneous in its views.

Before I proceed to any farther discussion upon the present subject, it will be necessary to offer a synoptical view of an arrangement of medicinal bodies founded upon the basis of their operations, in order that I may be better enabled to illustrate the observations which it is my intention to introduce: for this purpose I shall present the reader with three different classifications, of this kind, the first being that proposed by Dr. Cullen,* and which is now admitted to rest on principles nearly altogether false; but the investigation of which will afford many useful lessons of practical importance; the second classification is by Dr. Young;† and the third is that proposed by Dr. Murray,‡ which, from its simplicity, and strict conformity with the views I intend to offer, will be adopted as being the most eligible for the occasion.

CULLEN'S ARRANGEMENT OF THE MATERIA MEDICA.

Medicamenta agunt in

- SOLIDA.
  - SIMPLICIA.
    - *Astringentia.*
    - *Tonica.*
    - *Emollientia.*
    - *Erodentia.*
  - Viva.
    - *Stimulantia.*

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* Treatise on the Materia Medica, vol. 1. p. 191.

† Medical Literature, (*Pharmacology,*) p. 425.

‡ System of Mat. Med. vol. 1. p. 132.

- *Sedantia.*
    - *Narcotica.*
    - *Refrigerantia.*
- *Antispasmodica.*

FLUIDA.

- IMMUTANTIA.
    - Fluiditatem.
        - *Attenuantia.*
        - *Inspissantia.*
    - Misturam.
        - Acrimoniam Corrigentia.
            - *In Genere.*
                - *Demulcentia.*
            - *In Specie.*
                - *Ant-acida.*
                - *Ant-alkalina.*
                - *Antiseptica.*

- EVACUANTIA.
    - *Errhina.*
    - *Sialogoga.*
    - *Expectorantia.*
    - *Emetica.*
    - *Cathartica.*
    - *Diuretica.*
    - *Diaphoretica.*
    - *Menagoga.*

CLASSIFICATION OF THE MATERIA MEDICA, BY DR. YOUNG.

◆

- I. CHEMICAL AGENTS.
    - 1. *Caustics.*
    - 2. *Antiseptics.*
    - 3. *Antidotes.*
    - 4. *Demulcents.*
    - 5. *Diluents.*
- II. VITAL AGENTS.
    - A. Supporting Strength.
        - 1. *Nutrients.*

B. Causing Action.

Partial & Transient.

1. *Expergefacients.*
2. *Excitants.*
3. *Calefacients.*
4. *Sudorifics.*
5. *Errhines.*
6. *Sialogogues.*
7. *Expectorants.*
8. *Stomachics.*
9. *Emetics.*
10. *Cathartics.*
11. *Chologogues.*
12. *Hydragogues.*
13. *Simply Propellents.*
14. *Anthelmintics.*
15. *Diuretics.*
16. *Carminatives.*
17. *Emmenagogues.*
18. *Epispastics.*
19. *Suppuratories.*
20. *Sorbefacients.*
21. *Astringents.*

Permanent.

Tonics.

C. Diminishing Action, or Sensation.

Primarily 1. *Narcotics.* 2. *Sedatives.* 3. *Nauseants.* 4. *Diaphoretics.*

Secondarily *Exhaurients.*

III. INSENSIBLE AGENTS.

Specifics.

CLASSIFICATION OF REMEDIES, BY DR. MURRAY.

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A. GENERAL STIMULANTS.

a. Diffusible.
- *Narcotics.*
- *Antispasmodics.*

b. Permanent.
- *Tonics.*
- *Astringents.*

B. LOCAL STIMULANTS.

Emetics.
Cathartics.
Emmenagogues.
Diuretics.
Diaphoretics.
Expectorants.
Sialogogues.
Errhines.
Epispastics.

C. CHEMICAL REMEDIES.

- *Refrigerants.*
- *Antacids.*
- *Lithontriptics.*
- *Escharotics.*

D. MECHANICAL REMEDIES.

- *Anthelmintics.*
- *Demulcents.*
- *Diluents.*
- *Emollients.*

With respect to the classification of Dr. Cullen, we may commence our objections by stating that the very basis upon which it rests is a mere gratuitous assumption, viz. *that certain medicines act on the fluids of the body.* With the exception of a very few substances, it is now generally admitted that medicines produce their effects by acting on the living materials of which our organs are composed, and not by modifying the specific gravity or chemical composition of the fluids which they happen to evacuate. The origin of this latter opinion is to be traced to the exploded notions of the humoral pathologists, and to the exclusive doctrine of the earlier chemists; for as the former recognised a depraved condition of the fluids as the source of every disease, so did the latter imagine that every remedy operated by producing a chemical change upon its composition; and the remedial value of a medicinal substance was estimated by effects upon inert matter. Thus were experiments made with different substances upon the blood, and other fluids of the body, in order to deduce, from the results, the nature and extent of their powers as agents upon the living frame; for instance, the *spirit* and *salt of hartshorn* as they were found to render the blood more fluid, when added to it, *out of the body*, were indiscriminately administered in almost every complaint, with a view to dissolve that "lentor of the fluids" which was regarded as the more general source of disease. For similar reasons, a tribe of medicines were introduced into practice under the title of *Antiseptics*, for the prevention of a process, which very probably never takes place in the living body; the powers of these supposed agents were, as usual, inferred from their effects in resisting and preventing the putrefaction of dead matter. Nor is the distinction assumed by Dr. Cullen, between the action of remedies on the *Simple* and *Living* solids less hypothetical, "*Medicamentum non agit in Cadaver.*" Tonics and astringents may certainly exert a beneficial effect upon the animal fibre, but not by any immediate action on its materials, but through the agency of its living principle.

The classification of Dr. Young, although it presents many points of interest and value, is not altogether free from objection; his classes in some instances are perhaps unnecessarily subdivided, without a sufficient regard to the primary and secondary operations of the substances which they include. The arrangement of Murray has been adopted in the present inquiry, not as being less objectionable, in a general point of view, but as one which from its simplicity, is best calculated as a frame-work, if I may so express myself, for the display of those particular facts, the knowledge of which I consider essential for the successful administration of medicinal agents, and for the full comprehension of those practical doctrines which it is the exclusive object of this work to inculcate.

Dr. Murray observes that, in this arrangement, he places in the first division, those substances which exert a GENERAL STIMULANT operation on the system. Of which there are two subdivisions, the DIFFUSIBLE and the PERMANENT; the former including the class of *Narcotics*, with which may be associated, as not very remote in their operation, the class of *Anti-spasmodics;* the latter comprising two classes, viz. *Tonics and Astringents.* Through these there is a gradual transition from the most highly diffusible stimulant, to those most slow and durable in their action.

A second division comprehends LOCAL STIMULANTS, those, the action of which is determined to particular parts of the system. Such are the classes of *Emetics*, *Cathartics*, *Emmenagogues*, *Diuretics*, *Diaphoretics*, *Expectorants*, and *Sialogogues;* with which may be associated the classes of *Errhines* and of *Epispastics*, founded on direct local application.

The remaining classes include substances which do not operate according to laws peculiar to the living system. To one division may be referred those, whose effects depend on the CHEMICAL changes they produce in the fluids or solids; the classes which may be established on this principle are *Refrigerants*, *Antacids*, *Lithontriptics*, and *Escharotics*. To another division belong those, the operation of which is purely MECHANICAL, as *Anthelmintics*, *Demulcents*, *Diluents*, *Emollients*, and certain *Laxatives*.

Under the above classes, says Dr. Murray,* may be comprehended all those substances, which are capable of producing salutary changes in the human system, and which are used as remedies. I have stated my reasons for adopting this as a general basis of classification, although I shall deviate very considerably in the subordinate divisions of the plan, in the hopes of establishing some distinctions that may tend to practical utility.

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* A System of Materia Medica and Pharmacy, vol. I. p. 131.

I. GENERAL STIMULANTS.

The four classes comprehended under this first division, are NARCOTICS, ANTISPASMODICS, TONICS, and ASTRINGENTS.

Although these remedies differ very essentially in the degree and permanence of their action, as well as in the character of their apparent effects, yet, as it is conceived that their *primary* operation is stimulant, they are considered as possessing sufficient general similitude to sanction their arrangement under one comprehensive division.

NARCOTICS.

Synon:—*Sedatives. Anodynes. Hypnotics. Soporifics.*

Substances which in a moderate dose occasion a temporary increase of the actions of the nervous and vascular systems, but which is followed by a greater depression of the vital powers than is commensurate with the degree of previous excitement, and which is generally followed by sleep.

The relative intensity of these primary and secondary effects varies in the different narcotics, and even in the same narcotic in different doses; in some cases, especially if the quantity administered be considerable, the symptoms of diminished sense and action follow so immediately, that the previous stage of increased action is very obscure, or not in the least perceptible, while in other cases, the operation of the substance is more particularly directed towards the heart and arteries, and syncope succeeds its exhibition. These facts have led many physiologists to deny the stimulant nature of these bodies, and to consider their primary operation as one of a depressing kind, whence they have bestowed upon them the name of SEDATIVES; in referring to the classification of Cullen and Young, we shall find that the arrangement of these bodies has been directed in strict conformity with such a view of the subject; but it may be asked, how the increased excitement and exhilaration which so obviously follow the use of these bodies, in small doses, can be reconciled with that theory which considers them as absolutely and primarily sedative? In order to combat an argument so fatal to his hypothesis, Dr. Cullen summons to his aid the potent intercession of his tutelar deity, the *Vis Medicatrix*, a power which he supposes to preside over our living body, and with anxious vigilance, to resist the invasion of every thing that is noxious, or hostile to its health and wellbeing; with such assistance it was not difficult to explain any paradox in physiology, and the anomalies attending the agency of narcotic medicines were accordingly, in the school of Cullen, easily reconciled with the views of a favourite theory. He supposed that whenever a *sedative* was applied in a moderate dose, the *Vis Medicatrix* took the alarm, and excited all the powers of the system, in order to throw off the noxious application, and that thus *indirectly* arose those peculiar symptoms of increased action; but that when the dose was more considerable, he contended that the preserving power of the system was silenced, and unable to offer any salutary resistance, and consequently that universal depression immediately followed; but there is no direct evidence in support of the existence of such a power, and still less of its influence upon such occasions; it is far more philosophical to refer the operation of narcotics to a peculiar stimulating power, remarkable for the extreme rapidity with which it exhausts the energy of the nervous system. No one will deny the stimulating powers of alcohol, and yet a very large draught of this liquor will occasion extreme exhaustion without the occurrence of any signs of previous excitement; nor will any one be disposed to question the depressing influence of opium, and yet small doses have enkindled excitement and sustained the powers of life, under circumstances of extreme and alarming exhaustion.*

From the celerity with which narcotics produce their effects, it is reasonable to suppose that they act upon the nervous system through the sympathetic relations of the stomach, although in some instances it is highly probable that these bodies are actually absorbed into the circulation; I am inclined to think that this occurs with opium, as death is accelerated in cases of persons poisoned by it, by the adoption of those measures which are best calculated to promote its absorption: (*see Opium.*) Whether the effects of spirituous potations are to be attributed to the introduction of alcohol into the blood, or to the sympathies existing between the stomach and brain, is still a question of doubt. Dr. Cooke* relates a case, on the authority of Mr. Carlisle, of a person who was brought dead into the Westminster Hospital, in consequence of having drank a quart of gin for a wager, and that upon examination, a considerable quantity of a limpid fluid was found within the lateral ventricles of the brain, *distinctly impregnated with gin.* I very well remember the case, for it occurred during the period that I held the situation of Physician to that hospital, but it is very doubtful whether such an absorption occurs under ordinary circumstances. We well know the facility with which certain odorous bodies enter the circulation, and are developed in distant organs; it is therefore very possible that the apparent odour of the gin, which has been sometimes recognised in the secretions, may depend upon the presence of the flavouring ingredients, independent of the alcohol!

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* During the severe campaigns of the late war, the Surgeons of the French army were in the practice of administering Opium and Cayenne Pepper to the soldiers who were exhausted by fatigue.

In concluding the history of Narcotics, it may be observed, that there is, perhaps, no class of medicinal bodies, the individuals of which are less disposed to bend and conform to an artificial arrangement; each would seem to have its own particular mode of operation, and to affect sensibility in its own peculiar manner; and hence the practitioner will often find that, after the failure of one narcotic, the administration of another will induce sleep.

ANTISPASMODICS.

Substances which have the power of allaying the inordinate action of muscular structures, and of assuaging pain, without occasioning that state of insensibility which characterizes the operation of narcotics.

There are certain medicinal bodies which would appear to exert a specific control over spasmodic action, from whatever cause it may have originated, such are *Assafœtida*, *Galbanum*, *Musk*, *Castor*, *Ammonia*, *Valerian*, *&c.* To such remedies the term antispasmodic more exclusively belongs, but in a more general view of the subject we must admit that this class branches, by indefinable gradations, into narcotics and tonics; for since spasm may be connected with the most opposite states of the body, it is very evident that many of the individuals included in the class of antispasmodics, can only be relative agents: spasm, for instance, may arise from excessive irritability, as from teething, wounds, worms, &c. in which case a narcotic would prove beneficial, or it may depend upon a state of general debility, the proper remedy for which would be the assiduous exhibition of some permanent tonic.

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* *Treatise on Nervous Diseases*, vol. 1. p. 221.

TONICS.

Substances, whose continued administration gives strength and vigour to the body.

It is very justly admitted that a state of permanent tension in the fibres of the body, is necessary for the existence of life, and that any undue departure from such a condition is followed by debility. Thus, Sir Gilbert Blane observes that no muscle, whether voluntary or involuntary, can act unless its fibres are previously in such a state, that if divided they would shrink by their resiliency, leaving an interval between the cut extremities; the same may be said of the vascular system in all its ramifications, in order to give play to their contraction in grasping and propelling their contained fluids. It appears that there are certain medicinal bodies that have the power of affecting this state of tension, and when their effects contribute to its restoration, they are properly denominated *Tonics*. We are not, however, to consider them as producing such a change by any mechanical operation upon the matter of which the fibre is composed, but by a direct action upon its living principle; it seems probable that certain poisons thus produce sudden death by their agency on the vital principle, by which the tension of the whole arterial system is immediately relaxed. In this point of view, *Tonics*, like the other remedies which we have described, may be *relative* or *absolute* in their operation. Venesection, purgation, or whatever will, under certain conditions of the body, occasion a salutary change in its vital powers, may produce a corresponding alteration in the tension of its fibres, and consequently fall under the denomination of a tonic remedy: but independent of the state of the body, there would seem to be certain substances that act as specific stimuli upon the living fibre, and are in certain cases indispensable for the maintenance of its healthy tone; such are vegetable bitters, which produce a powerful effect upon the digestive organs, and by nervous sympathy, upon the rest of the system. *Bitter Extractive*,* seems to be as essential to the digestion of herbivorous, as salt is to that of carnivorous animals; it acts as a natural stimulant, for it has been shown by a variety of experiments that it passes through the body without suffering any diminution in its quantity, or change in its nature. No cattle will thrive upon grasses which do not contain a portion of this vegetable principle; this fact has been most satisfactorily proved by the late researches of Mr. Sinclair, gardener to the Duke of Bedford, which are recorded in that magnificent work, the "HORTUS GRAMINEUS WOBURNENSIS." They show, that if sheep are fed on *Yellow Turnips*, which contain little or no bitter principle, that they instinctively seek for, and greedily devour any provender which may contain it, and that if they cannot obtain it they become diseased and die. We are ourselves conscious of the invigorating effects of slight bitters upon our stomach; and their presence in malt liquors not only tends to diminish the noxious effects of such potations, by counteracting the indirect debility which they are liable to occasion, but even to render them, when taken in moderation, promoters of digestion. The custom of infusing bitter herbs in vinous drinks is very ancient and universal; the *Poculum Absinthiatum*, was regarded in remote ages, as a wholesome beverage, and the Wormwood was supposed to act as an antidote against drunkenness. The Swiss peasant cheers himself amidst the frigid solitude of his glaciers, with a spirit distilled from *Gentian*, the extreme bitterness of which is relished with a glee that is quite unintelligible to a more cultivated taste. With regard to the natural use of *Bitter Extractive*, it may be laid down as a truth, that it stimulates the stomach, corrects putrefying and unwholesome nutriment, promotes tardy digestion, increases the nutritive powers of those vegetable substances to which it is united, and furnishes a natural remedy for the deranged functions of the stomach in particular, and through the sympathetic medium of that organ, for the atony of remote parts in general; and I shall hereafter show, that in its medicinal applications it certainly imparts additional activity to many remedies, and renders the stomach and system more susceptible of their salutary energies. As an essential ingredient in the provender of herbivorous animals, it may I think be admitted as a fact, that its importance is *in an inverse ratio* with the nutritive powers* of the food, and we accordingly find, in conformity with that universal scheme of self-adjustment and compensation, that influences all the operations of nature, that cultivation, which extends the nutritive powers of vegetable bodies, generally diminishes their bitterness in the same proportion; the natural history of the Potato offers a good illustration of this fact, for the roots of this useful plant which have been so greatly improved by culture, are in their wild state both small and bitter.* Gummy matter, which seems to result from the first change of the sap, is undoubtedly rendered more digestible and nutritive by the presence of a *bitter;* pure gum is not very much disposed to yield to the assimilative functions; "it frequently passes through the bowels," says Dr. Chapman,† "very little changed, as I have witnessed a thousand times." We see therefore the value of the bitter principle, in the economy of the *Lichen Islandicus*, which is intended as the food of animals in northern latitudes; we are told that boiled linseed constituted the sole diet of the people of Zealand during a scarcity of long continuance, on which occasion, symptoms of great debility occurred, attended with those of dyspepsia; so again Professor Fritze, in his Medical Annals, states that vegetable mucilage, when used as a principal article of diet, relaxes the organs of digestion, and produces a viscid slimy mucus, and a morbid acid, in the primæ viæ, an effect which analogy shows may be obviated by the addition of bitter extractive. For the same reason animals that feed in marshy lands, on food containing but little nourishment, are best defended from the diseases they are liable to contract in such situations by the ingestion of bitter plants.‡ I have offered these views upon the subject of *Bitter Extractive*, as I feel satisfied that they will essentially contribute to the establishing of just and philosophical notions, respecting the necessity, and *modus operandi* of many vegetable tonics.

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* Bitterness in vegetables has been supposed to reside in a peculiar proximate principle, which has been accordingly named the *Bitter Principle*. Such an opinion, however, does not appear to rest on sufficient evidence; on the contrary, experiment has shown that it is very generally connected with the extractive matter of the plant, as it is obtained equally by the action of water and alcohol; it is not volatile, nor are its energies impaired by decoction.

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* Thus Sir H. Davy, in comparing the composition of the soluble products afforded by different crops from the same grass, found in every trial, the *largest quantity* of truly nutritive matter in the crop cut when the seed was ripe and *the least bitter extractive*, and saline matter; while in the autumnal crops these relations were found inverted. *Elem. of Agricult. Chem.*

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* Molina, in his *History of Chili*, speaking of the Potato, says, "It is indeed found in all the fields of that country, but the plants that grow wild, called by the Indians, *Maglia*, produce only very small roots of a bitter taste." Dr. Baldwin also found the wild parent of the potato plant at Monte Video, and Mr. Lambert informs us that this statement has been confirmed by Captain Bowles, who has not long since returned from the South American station; he says, "it is a common weed in the gardens, bearing small tubers, but *too bitter* for use. Royal Institution Journal, No. XIX.

† Discourses on the Elements of Therapeutics and Materia Medica, by N. Chapman, M. D. Philadelphia, 1819.

‡ Thus it has been found by experiments, that the *Menyanthes Trifoliata*, (the Water Trefoil,) which on account of its bitterness has been used as a substitute for Hops, is a cure for the rot in sheep, when given in doses of a drachm of the powdered leaves; and Dr. William Bulleyn, the cotemporary of Turner, the father of English Botany, observes in his work, entitled "THE BULWARK OF DEFENCE," that *Tormentil*, in pastures, prevents the rot in sheep. Upon these occasions nature is very kind, for the particular situation that engenders endemic diseases, is generally congenial to the growth of the plants that operate as antidotes to them.

As the action of tonics is gradual, so their operation is not followed by that exhaustion consequent upon the use of diffusible stimulants.

The substances which compose the class of tonics are derived from the vegetable and mineral kingdoms; those of the former are generally bitter, and produce their effects by a primary action on the stomach, and are not absorbed into the circulation, as experiments upon *Bitter Extractive* have most fully demonstrated; those derived from the mineral kingdom, comprehending several of the metals, appear in some instances to pass into the circulation, although several of them, like the vegetable tonics, act primarily on the *primæ viæ;* I apprehend this observation applies to the *nitrate of silver*, which certainly possesses considerable powers as a tonic in certain cases of dyspepsia, for which it may perhaps be indebted to the bitterness which distinguishes it.

AROMATICS.

Substances of a fragrant smell,* which produce upon the organs of taste a peculiar sensation of warmth and pungency, and occasion, when swallowed, a corresponding impulse upon the stomach, which is rapidly communicated to the remote parts of the body.

The vegetable bodies which constitute the class of aromatic stimulants are very intimately related with that of tonics; indeed, in the most efficient vegetables of the latter kind, the two qualities are generally blended, and the transition from these to the more pure bitters and aromatics is so imperceptible that it is extremely difficult to arrange them into different classes; Dr. Murray has accordingly in his classification, not attempted to separate substances which are so intimately connected. *Aromatic Stimulants*, however, in a practical point of view, must be distinguished from tonics, for the former are valuable for the rapidity, the latter, for the permanency of their effects. Their characteristic properties appear to depend chiefly, if not entirely, on an essential oil which, when extracted from the vegetable, exhibits all its aromatic power in a very concentrated form.

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* αρωμα, which is compounded of αρι, very, and οδμη, or οσμη, smell.

ASTRINGENTS.

Substances which, when applied to the human body, corrugate and condense its fibres, and at the same time, exert a tonic influence through the medium of its living principle.

Astringency in any substance may be at once recognised by the organs of taste; its power in corrugating the papillæ of the tongue, and in imparting a sensation of harshness and roughness to the palate, being too peculiar to be mistaken; this is a fortunate circumstance, for there does not exist any one chemical test by which we can invariably detect the property of astringency, since it is found to reside in many different classes of substances: thus acids, especially the stronger mineral ones, are powerfully astringent; so are many of the metallic salts, as those of iron, zinc, copper, and lead; and some of the earths, when combined with acids, of which alum is a striking example. The vegetable kingdom, however, furnishes the greater number of astringent remedies; and chemistry has shown that this property uniformly depends upon a peculiar proximate principle, characterized by its power of forming an insoluble compound with animal gelatine; to this principle the name of TANNIN has been given. As tannin generally exists in union with gallic acid, and as the latter body is known by its property of striking an inky blackness with the salts of iron, solutions of this metal were long, but erroneously, regarded as the proper test of vegetable astringency; the fallacy of this is at once shown by the habitudes of catechu, one of the strongest of our astringents, but which, nevertheless, will not yield the smallest degree of blackness to the solutions of iron, because it contains only tannin, the true principle of astringency, without a trace of its usual associate, the gallic acid. From the power which these substances possess of astringing, and condensing the animal solids, their medicinal properties are supposed to arise, and we may perhaps in this instance, admit such a mechanical explanation; but astringents possess also some power over the living principle of the matter which they astringe, for they are capable of acting as permanent stimulants, of curing intermitting fever, and of obviating states of general debility. Astringents would seem to moderate the morbidly increased secretions of distant parts, and to restrain hemorrhage, by their corrugating influence upon the *primæ viæ*,* which is extended by sympathetic action to the vascular fibre; it is not difficult for any person to conceive the possibility of such a sympathy, who has ever experienced the thrilling and singular feeling which is produced over the whole body, by the *acerb* taste of the sloe-juice. As, however, the primary operation of these bodies, by their actual contact with the animal fibre, must be much more powerful than that which results from the mere sympathy of parts, we find that the efficacy of astringents is principally displayed in the cure of diarrhœas, or serous evacuations from the intestinal canal; their operation in checking profuse fluor albus, gleet, and the inordinate secretions of other distant organs, is much less striking and unequivocal, and it is a question whether in many of such cases the benefit arising from their use may not depend upon their tonic powers. As the morbid excess of different evacuations may depend upon various and opposite states of the living system, so the individuals of the other classes may become astringents; and we are bound to admit upon this, as we have on other occasions, the existence of *absolute* and *relative* remedies.

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* When tannin is present in grasses, as Sir H. Davy found in that of *aftermath crops*, it is voided in the excrement by animals who feed upon it, together with the bitter extractive, saline matter, and woody fibre. (*Elem. of*

Narcotics, at the head of which stands opium, will frequently assume the character of astringents, by diminishing the irritability upon which increased discharges depend. In Diarrhœa, an astringent, properly so called, diminishes the flow of those acrid fluids into the intestines, by which their peristaltic motions are preternaturally increased, and it consequently represses the diarrhœa; a narcotic, under similar circumstances, might not repress the flow of the acrid matter to which I have alluded, but it would render the bowels less susceptible to its stimulus, and would therefore produce the same apparent alleviation, although by a very different mode of operation. There is yet a third species of remedy, which may operate in restraining a diarrhœa of this description; not by stopping the flow of acrid matter, nor by diminishing the irritability of the intestinal organs, as in the instances above recited, but simply, by *acting chemically* upon the offending matter, so as to disarm it of its acrid qualities; such, for instance, is the nature of *absorbent* and *testaceous* medicines. In the cure of hemorrhage, if it be *active*, that is to say, connected with a state of strong tonic contractility of the blood-vessels, a very different remedy will be required as an astringent, than in cases of *passive* hemorrhage, in which the vascular fibres are in a state of relaxation or collapse. Sir Gilbert Blane has offered some valuable remarks upon this subject, with a view to settle the difference

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Agricult. Chem. Appendix, p. lxi.) We may therefore infer by analogy that it never enters into the circulation.

of opinion which has arisen respecting the treatment of flooding after child-birth. (*Medical Logic*, *Edit.* 2d. p. 100.)

Astringents are capable of being exclusively used as local applications, and when they are so employed for the purpose of stopping hemorrhage, they are termed STYPTICS.*

LOCAL STIMULANTS.

This Second Division comprehends those medicinal substances, which have been generally classed under the head of EVACUANTS; for as they stimulate particular organs, they occasion, by their local operation, an increased secretion, or evacuation from them.

EMETICS.

Substances which excite vomiting, independent of any effect arising from the stimulus of quantity, or of that occasioned by any nauseous taste or flavour.

Before we can determine the *modus operandi* of emetics, it will be necessary to take an accurate view of the phenomena and pathology of vomiting. It is an important fact that any extraordinary stimulus applied to the stomach, instead of increasing its motions, as it would in other instances, actually inverts them: the wisdom of such a peculiar provision is manifest; it is intended to prevent the protrusion of the food into the duodenum before it has undergone those necessary changes in the stomach, by which it is prepared for the more elaborate process of chylification. The act of vomiting, however, is not effected by the sole influence of the stomach, the brain is an important accessary: Dr. Majendie goes so far as to attribute the operation of vomiting, exclusively, to the agency of this latter organ upon the abdominal muscles, and regards the stomach as a mere passive instrument in the act; this doctrine was supported in an elaborate experimental memoir, presented by this indefatigable physiologist to the Royal Institute of France in the year 1812. Although we shall not be disposed to receive this theory in its full extent, yet we cannot hesitate to admit that the influence of the nervous system is indispensably necessary for producing vomiting; and we accordingly find that this act will not take place, however forcibly the stomach may be goaded by emetics, where the energy of the nervous system is suspended, as in cases of profound intoxication, or in violent wounds and contusions of the head; while if the brain be only partially influenced, as by incipient intoxication, or by a less violent blow upon the head, its irritability is increased instead of being paralysed, and vomiting under such circumstances is excited by the slightest causes: the fact of such opposite results being produced by the same impulse in different degrees of intensity, is no less curious than instructive. Dr. Richard Harrison, in his Gulstonian Lecture before the College of Physicians, treated the subject of vomiting with much ingenuity, and I am disposed to adopt the views which he offered; he observed, that although the experiments of Majendie sufficiently testify the importance of the pressure of the abdominal muscles upon the stomach in the act of vomiting, and which can only be explained by the influence of the brain and nervous system, yet that he has attributed too much to their agency; "it appears to me," continued he, "that vomiting may be explained in the following manner:—*the irritation of the stomach makes a call upon the brain for the aid of the diaphragm and the abdominal muscles, in order to expel its contents; the diaphragm then becomes contracted and fixed, the ribs drawn down, and the abdominal muscles drawn inwards, so that the stomach is pressed on all sides by voluntary muscles, which, together* WITH ITS OWN CONTRACTION, *expel the contents.*" Now it must be obvious that where the brain, from oppression or injury, is unable to transmit its influence to these muscles,* and disregards the call of the stomach, vomiting can only be excited with difficulty, or it will be prevented altogether.

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* Various combinations, into which different metallic salts have generally entered as ingredients, have at different periods been extolled for their efficacy as *Styptics:* Helvetius published an account of a preparation composed of the filings of iron and tartar, mixed to a proper consistence with French brandy, and it was long used in France, Germany, and Holland, under the name of HELVETIUS'S STYPTIC.

EATON'S STYPTIC. After the styptic of Helvetius had been discarded from the Continent, it was brought into this country, and for a long time continued to be employed with confidence, under the new title of Eaton's Styptic. It is now made in several different modes, and consists chiefly of an alcoholic solution of *sulphate of iron*, with some unimportant additions.

Under such circumstances venesection may in some cases prove a powerful adjuvant, by unloading the vessels of the brain, and thus restoring to the nervous system its necessary excitability; where its powers have been paralysed by the operation of a narcotic, a copious draught of some vegetable acid, or the affusion of cold water upon the surface of the body, may impart efficiency to an emetic; the operation of *Nightshade* and some other narcotic poisons may be adduced in farther illustration of this subject;—an excessive dose of the *Atropa Belladonna* produces symptoms of alarming stupor, and so difficult is it to evacuate the stomach under such circumstances, that as much as fourteen grains of *Tartarized Antimony* have been administered without effect: now if in such a case a copious draught of some vegetable acid be given, the emetic will be more likely to succeed: here then we perceive, that the brain, being paralysed by a narcotic poison, is unable to lend its aid to the muscles requisite for the operation of vomiting, until its energies are restored by the antinarcotic powers of a vegetable acid. The practical precaution which this view of the subject affords, is extremely important,—*not to allow the apparently inactive state of the stomach to induce us, inconsiderately, to augment the dose of an emetic*: for although the stomach, for the reasons just stated, may be unable to void its contents by vomiting, it may nevertheless retain its sensibility, and be therefore liable to inflammation: Dr. Harrison has reported a case of this kind, where the practitioner, in attempting to excite emesis in an epileptic patient, by a very large dose of *sulphate of zinc*, produced an inflammation in this viscus that terminated fatally.

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* Upon the very same principle, a person may die from suffocation, in consequence of an injury in the brain, the respiratory muscles being unable to sustain the function of breathing, for want of a due supply of nervous influence.

Those who wish for farther information upon this subject may consult the chapter on SUFFOCATION, in my work on "MEDICAL JURISPRUDENCE."

Vomiting may also be produced by the *primary* operation of certain agents upon the brain, by which its energy is disturbed, as by narcotics, or by the motions of swinging, whirling, and sailing: in such cases, the series of actions necessary for the establishing of vomiting, commences in the brain, and is propagated by nervous sympathy to the stomach.

When an emetic is taken into the stomach, an interval of twenty minutes, or longer, usually passes without any apparent effect; an uneasy sensation which we term nausea, is then felt, and this continues to increase until vomiting begins; here then we perceive are two distinct stages, each of which is marked by its own proper symptoms; the relative intensity and duration of which will be found to vary according to the nature of the exciting causes; thus some emetics, as *Sulphate of Zinc*, act without occasioning much nausea, while others, as *Tobacco*, excite it to a degree which is far greater than is proportioned to their emetic power: this is a fact of great importance in directing us in the selection of an Emetic, for we shall find that in some diseases it is a great object to avoid that state of system which invariably accompanies nausea, while in others it affords the best mode of answering an important indication of cure.

Nausea would seem to depend upon the exertions of the stomach and muscles, not being proportioned to the effects of the brain, in order to produce vomiting. Where this balance however is maintained, as during the operation of an ordinary emetic, the following are the symptoms which characterize the two stages:—while the nausea only is present, the countenance is pale and shrunken, the pulse feeble, quick, and irregular, and there is a feeling of cold; but as soon as vomiting commences, the face becomes flushed, the pulse quicker and stronger, although it seldom returns to its natural standard, until some time after the vomiting has ceased; a degree of languor, a disposition to sleep, and a general moisture upon the skin, are the circumstances which occur after the total cessation of the paroxysm.

The feeble state of the circulation, as indicated by the pulse, and the general coldness and languor experienced during a paroxysm of nausea, are to be ascribed to those sympathetic relations by which the brain, stomach, and heart are reciprocally influenced.

The advantages to be obtained from the administration of an emetic in the cure of disease, may either depend upon its *primary*, or *secondary* operations, that is to say, upon the mere evacuation of the stomach, or upon those changes which occur in distant parts from sympathy; and the judicious practitioner, in the selection of an emetic, will always be guided by the nature of the indication which he intends to fulfil: if his object be to evacuate the stomach quickly and completely, he will avoid those emetics that are distinguished by their nauseating tendency, as in cases of disease which depend on a disordered state of stomach, connected with undue distention, and the presence of acrid and indigestible matter; if on the other hand his intention be to influence some remote organ through the sympathetic powers of the stomach, an emetic of an opposite tendency may be better calculated to answer such indications: in some cases, he is to seek a beneficial result from the mechanical action of the diaphragm and abdominal muscles, by whose pressure the gall-bladder and hepatic ducts are emptied of their contents, and hence jaundice, arising from the obstruction of biliary calculi, has been suddenly removed by the *concussion* of an emetic: a similar pressure upon the thoracic viscera may occasion expectoration, and relieve the bronchial vessels in cases of asthma, catarrh, and croup.

Vomiting, when produced by the operation of a mild emetic, does not appear to exhaust the excitability of the stomach, but on the contrary, to increase its tone; for we generally find the process of digestion is carried on more vigorously afterward; although it is probable that, by frequent repetition, a different result would be obtained, and we should find that its motion would become liable to inversion by slight stimuli; we may therefore question the propriety of that practice which is so strenuously recommended by Hippocrates,[*] and other ancient physicians, to administer emetics frequently to those in health, in order to prevent the incursions of disease.

The benefits arising from the secondary effects of an emetic are numerous and extensive. It has been observed that during Nausea, the force of the circulation is considerably abated, hence the use of these remedies in hemorrhage; and as the energy of absorption is generally in an inverse ratio to that of the circulation,[†] we frequently obtain from a nauseating dose of an emetic, considerable assistance in the treatment of anasarca, and other dropsical swellings. Those medicines that are liable to produce at once full vomiting, without any previous stage of nausea, are of course less calculated to fulfil such indications; for the same reason, whenever our object is to evacuate the stomach, and to prevent absorption, we must take care to cut short the nauseating stage; a precaution which is highly important in the treatment of a case of poisoning. The state of the stomach, produced by vomiting, is very frequently extended, by sympathy, to the vessels of the skin; in consequence of which a diaphoresis not unusually follows the operation. In the different varieties of febrile disease, this circumstance stamps additional value upon the class of Emetics; while, at the same time, they eject any offensive matter which may be present in the stomach, and control the accelerated circulation.

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[*] *Hippocrat. de Diæta, lib. iii. et alibi passim.*

This predilection of the ancients for Emetics is the more extraordinary, as they were acquainted with those only which were of the most violent and unmanageable description; the *Veratrum* or *White Hellebore*, was sometimes fatal.

[†] Few discoveries in physiology have thrown greater light upon this important subject than that of M. Majendie, published in his JOURNAL DE PHYSIOLOGIE EXPERIMENTALE, (1^er^ *numero*—Janvier, 1821) in a paper entitled, "*Memoire sur le Méchanisme de L' Absorption.*" The results contained in this essay are the more interesting to me, as they were read at the *Academy of Sciences* at Paris, some time after the publication of the *Third Edition* of my PHARMACOLOGIA, and it will be observed, in what a satisfactory manner they confirm the views which I offered at that time, respecting the influence of venesection in accelerating the absorption of Mercury. In the *Fourth Edition* (*published in October*, 1820, *p.* 115,) these views were farther extended, and as I could not have been influenced by the experiments of M. Majendie, which were not published until some time afterward, it is very fair to conclude, that when two persons arrive at the same result by different trains of investigation, such a result must be correct. The conclusions established by the experimental inquiries of M. Majendie, with regard to absorption, appear to me to be so important, in reference to the object of the present work, that I shall pause, in this place, for the purpose of furnishing the reader with a short account of them. M. Majendie states, that while performing the experiment of injecting warm water into the veins of a living animal, he first conceived the idea of observing what effects would be produced upon the function of absorption by the artificial phlethora, thus occasioned; having accordingly injected a quantity of water into the venous system of a middle-sized dog, he introduced a small portion of an active substance, whose effects were well known, into his side, when he was surprised to find that its usual operation was not manifested until after an interval much longer than usual; the same experiment was afterward repeated upon another animal, and with similar results. In a third experiment as much water (*obout two pounds*) was injected as the animal could sustain, without destruction, in which case the poisonous substance produced no effect whatever, the powers of absorption appearing to be entirely suspended; and having waited during half an hour for the occurrence of those symptoms which, under ordinary circumstances, would have manifested themselves in two minutes, M. Majendie concluded that if

From the violent muscular exertions which take place in the act of vomiting, the administration of an emetic may be very injurious in certain states of the body. In consequence of the pressure applied to the descending aorta, and the interrupted circulation through the lungs, from impeded respiration, the blood returns with difficulty from the head during a paroxysm of vomiting, and in plethoric states of the body, or in cases of determination of blood to the cerebral organs, the act of vomiting cannot be considered as free from danger. The concussion of an emetic may also produce mischief in the advanced stage of pregnancy, and in *hernia* and *prolapsus uteri*; while in extreme debility, there is the danger of a syncope being produced, from which the patient may never recover, as I once witnessed in the last stage of Phthisis, where an emetic

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vascular congestion be the cause of the suspension of absorption, the function ought to be restored by the removal of this artificial condition, an opinion which he proceeded to verify by experiment; the jugular vein of the animal, under trial, was accordingly opened, and the ingenious operator had the satisfaction to observe the effects of the poison gradually developing themselves in proportion as the blood flowed. M. Majendie next proceeded to confirm the truth of his position, by an experiment, the converse of those above related; an animal was bled, to the amount of about half a pound, and the poisonous substance applied to the pleura of the animal, as in the foregoing experiments, when it appeared that those effects which, under ordinary circumstances, were not evident until after a period of twelve minutes, manifested themselves after an interval of only thirty seconds. In order to show that these results actually arose from vascular distention, and not from the artificial state of dilution in which the blood was placed, M. Majendie instituted the following experiment; a considerable quantity of blood was drawn from the vein of a dog, and replaced by a similar quantity of warm-water, after which a measured quantity of *Nux Vomica* in solution was introduced into the side, when the poisonous effects were found to take place with the same rapidity, as if the blood had not been mixed with water was imprudently given, with the intention of dislodging the pus with which the lungs were embarrassed.

The different emetics employed in practice are derived from the vegetable and mineral kingdoms, some of which appear to produce their effects by an immediate impression upon the nerves of the stomach, while others require to be absorbed into the circulation before they display their energies. *Ipecacuanha* would seem to act primarily on the stomach, but *Tartarized Antimony* has been found by experiment to occasion vomiting, when injected into the vein of an animal; while the other mineral emetics, *viz.* the preparations of *Antimony*, *Copper*, and *Zinc*, undoubtedly operate on the stomach, and without inducing much nausea.

CATHARTICS.

Medicines which quicken or increase the evacuation from the intestines, or which, when given in a certain dose, occasion purging.

These remedies, from a general difference in their modes of operation, have been classed under two divisions—LAXATIVES and PURGATIVES. The former operate so mildly that they merely evacuate the contents of the intestines, without occasioning any general excitement in the body, or even stimulating the exhalant vessels of the canal; the latter produce a considerable influx of fluids from these vessels, and extend their stimulant effect to the system in general; and where these effects are very violent, the purgative is further distinguished by the epithet DRASTIC. Laxatives then may be said to empty the bowels simply, and to carry off extraneous matter, which is out of the course of the circulation; but purgatives, as they occasion a constitutional effect, may be made subservient to very important purposes. The effects of a purgative may depend upon three different modes of operation: viz.

1. *By stimulating the muscular fibres of the Intestines, whence their peristaltic motion is augmented, and the contents of the bowels more quickly and completely discharged.*
2. *By stimulating the exhalant vessels, terminating in the inner coat of the intestines, and the mouths of the excretory ducts of the mucous glands; by which an increased flow of serous fluids takes place from the former, and a more copious discharge of mucus from the latter; the effect of which is to render the fæcal matter thinner and more abundant.*

3. *By stimulating the neighbouring viscera, as the Liver and Pancreas, so as to produce a more copious flow of their secretions into the intestines.*

It appears that different purgatives have very different powers in relation to the several modes of operation above specified; some medicines, for example, urge the bowels to evacuate their contents by an imperceptible action upon the muscular fibres, and little or no increase of serous discharge attends the evacuation, such are *Manna, Sulphur*, and *Magnesia;* there would seem, moreover, to be certain bodies that have the property of increasing the peristaltic motions by operating as mechanical stimulants upon the fibre; it would not be difficult to derive many illustrations of this fact, from the history of herbivorous quadrupeds, and I have been disposed to consider the harsh and coarse texture which certain grasses assume in moist situations, as being calculated to furnish an increased stimulus to the intestines of the animals who feed upon them, at a time when their diminished nutritive qualities must render such a result desirable; but the operation of a mechanical laxative may be demonstrated by a more familiar example; the addition of bran to our bread, constituting what is known by the name of *Brown bread*, induces laxative effects merely from the mechanical friction of the rough particles or scales of the bran upon the inner coats of the intestines, for the wheat without the bran in bread is not particularly laxative.* Other cathartics stimulate the fibres to a much greater degree, and the effects are either confined to a part of the canal, or communicated to the whole range of the intestines, from the duodenum to the extremity of the rectum; *Aloes* will furnish a good example of the former, and *Colocynth* may be adduced as an instance of the latter mode of operation. Other cathartics again, direct all their stimulus to the exhalant vessels, and are accordingly distinguished by the force with which they produce serous evacuations; and for which reason they were formerly denominated *Hydragogues*, such are *Saline Purgatives*, and certain vegetable bodies to be hereafter described. Dr. Cullen has even supposed that some of these medicines may act solely in this way, and without increasing directly the peristaltic motion; there is, however, as Dr. Murray very justly remarks, no proof of such an hypothesis, and it seems scarcely probable that any substance should act as a stimulant on these vessels, without at the same time stimulating the mobile fibres of the intestines. *Mercurial Purgatives* appear to possess, in an eminent degree, the power of exciting the functions of the liver, and of thereby occasioning an influx of bile into the intestines. From the indications which cathartics are capable of fulfilling, their utility in many diseases must be apparent; the extent of their importance and value were, however, never justly appreciated until the valuable publication of Dr. Hamilton on this subject, in which the author has pointed out with more precision than any preceding writers had done, the therapeutic principles which should regulate their administration. His practice has clearly proved that a state of bowels may exist in many diseases, giving rise to a retention of feculent matter, which will not be obviated by the occasional administration of a purgative, but which requires a continuation of the alvine stimulant, until the healthy action of the bowels is re-established. Since this view of the subject has been adopted, numerous diseases have received alleviation from the use of purgatives, that were formerly treated with a different class of remedies, and which were not supposed to have any connexion with the state of the alvine evacuations; thus, in fever, the peristaltic motion of the intestines is diminished, and their feculent contents are unduly retained, becoming of course a source of morbid irritation; this fact has been long understood, and the practice of administering cathartic medicines under such circumstances has been very generally adopted; but until the publication of Dr. Hamilton, physicians were not aware of the necessity of carrying the plan to an extent beyond that of merely emptying the *primæ viæ*, and they did not continue the free use of these remedies through the whole progress of the disease.

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* The practical application of this fact may be useful, and digestion, in certain cases, may be promoted by the simple expedient of changing the quality of our bread.

Cathartics are essentially serviceable also in several diseases of the class NEUROSES, which are generally intimately connected with a morbid condition of the alimentary passages; *Chorea* and *Hysteria* have been very successfully treated in this manner. The diseases incident to puberty in both sexes are also best relieved by a course of purgative medicines, and their effects in *Chlorosis* have conferred upon many of them the specific title of EMMENAGOGUES.

But the therapeutical utility of Cathartics extends beyond the mere feculent evacuations which they may occasion. In consequence of the stimulating action which some of them exert upon the exhalant vessels, they abstract a considerable portion of fluid from the general current of the circulation, and are on that account beneficial as *Anti-phlogistics*. For the same reason they may act as powerful promoters of absorption, for there exists an established relation between the powers of exhalation and absorption, so that when the action of one is increased, that of the other is augmented.

Certain Purgatives, as I have just stated, exert their influence upon the neighbouring organs, and are calculated not only to remove alvine *sordes*, but to detach and eliminate foul congestions from the biliary ducts and pores.

With such facts before us, it is impossible to concede to the opinion of Dr. Hamilton, that the different species of purgative medicines *do not possess distinct powers over the different species of matter to be evacuated*; on the contrary, there is reason for reviving the ancient theory, too inconsiderately abandoned, and which acknowledged these different distinctions in the operations of cathartic medicines, under the appropriate names of *Hydragogues*, *Cholagogues*, *&c.*

The importance of cathartic medicines having been shown, and the distinctions in their modes of operation established, it only remains to say a few words upon the subject of their abuse. All the remedies of this class, but more especially those of considerable power, require caution in their administration, even in those diseases where they are indicated by peculiar symptoms, especially if there be any tendency to inflammation or to extreme debility, although this latter symptom is often rather apparent than real, and is at once removed by the brisk operation upon the bowels; during pregnancy, and immediately after delivery, and during the flow of the menses, the prudent practitioner will use a discretionary caution in their exhibition. The too frequent use of these medicines will induce marasmus, and render the bowels so morbidly irritable, that purging is easily excited by the ordinary stimulus of our aliments; while in some habits the contrary obtains, and the resource to which the valetudinarian flies for relief, only increases the torpor of the intestines, and confirms his costiveness.

The mode of adapting, combining, and administering Cathartics, will present subjects for our future consideration.

EMMENAGOGUES.

Medicines which are capable of promoting the Menstrual discharge.

As Amenorrhœa, or retention of the menses, is generally the effect of a morbid state of the body, it follows that remedies capable of acting as Emmenagogues can only be *relative* agents, unless indeed we are disposed to accede to the opinion so generally maintained in the writings of the older physicians, but now generally discarded, *that certain substances exert a specific* action upon the uterus.* It may certainly be asserted, without fear of contradiction, that there are many substances which, when received into the stomach, have their stimulant operation more particularly determined to one part than to another; alkalies, for example, to the kidneys. Reasoning, therefore, by analogy, it was not unphilosophical to conclude that similar medicines might exist with respect to the uterus; but experience has negatived the supposition, there being no proof of any of the substances styled *Emmenagogues* producing their effects from any specific influence upon the uterine system. If the term *Emmenagogue* be assumed conventionally, according to this view of the subject, it may be retained without any fear of error, otherwise it would be wiser to remove the name from our classification.

The suppression of the catamenia usually depends upon a debilitated state of the body, although it is sometimes the consequence of a plethoric diathesis; in the former cases tonics, in the latter venesection may display the powers of an emmenagogue. Where the disease occurs in young women, about the age of puberty, it is very generally connected with extreme debility of the system; the preparations of iron, bark, and other invigorating medicines, are accordingly the most likely to succeed in its cure. Whereas in full florid habits, when the catamenia are suddenly suppressed, *Laxatives*, *Diaphoretics*, or *blood-letting*, afford the surest means of relief.

There are two other classes of medicines which may occasionally prove emmenagogue—ACRID PURGATIVES which act upon the rectum, and hence by *contiguous sympathy* upon the uterus, as *Aloes*, &c. and STIMULATING DIURETICS, as *Cantharides*, the *Turpentines*, &c. which are supposed to excite the womb, sympathetically, by their stimulus upon the bladder.

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* The *Melampodium*, or Black Hellebore, was recommended as an agent of this description in the strongest terms, by Mead; *Savin* (*Juniperus Salina*) is another vegetable which has been generally considered as a specific Emmenagogue; with some authors, the *Rubia Tinctorum*, *Madder*, with others the *Sinapis alba*, have been regarded as remedies of this nature.

DIURETICS.

Medicines which increase the urinary discharge.

This effect is produced by very different modes of operation; and as some of them are mutually incompatible with each other, it is essential that we should understand the *modus operandi* of each individual of which the class consists, in order that we may direct its application with precision.

There is undoubtedly no tribe of medicinal agents more precarious in their nature and effects than that of Diuretics; this fact in a great measure depends upon the uncontrollable character of the organs upon which they act, but it must at the same time be admitted, that their failure frequently depends upon their modes of operation being directly incompatible with the state of the system, at the time of their administration.

The following classification may perhaps serve to bring together the principal facts which are known upon the subject, and at the same time to display them in an order which is calculated to demonstrate their practical bearings and relations.

A SYNOPTICAL ARRANGEMENT OF DIURETIC REMEDIES,

According to their supposed Modes of Operation.

CL: I.—MEDICINES WHICH ACT *PRIMARILY* ON THE URINARY ORGANS.

1. *By stimulating the secreting vessels of the kidneys*, BY CONTACT.
   - a. The Medicines not undergoing any decomposition *in transitu*.
     - 1. *Potassa.*
     - 2. *Potassæ Nitras.*
     - 3. *Oleum Terebinthinæ.*
     - 4. *Juniperus Communis.*
     - 5. *Cantharides.*
   - b. The Medicines undergoing decomposition *in transitu*.
     - 1. *Potassæ Acetas.*
     - 2. *Potassæ Super-tartras.*
     - 3. *Scilla Maritima.*
     - 4. *Colchicum Autumnale.*
     - 5. *Copaifera Officinalis.*
     - 6. *Spartii Cacumina.*

CL: II.—MEDICINES WHICH ACT *PRIMARILY* ON THE ABSORBENTS, AND *SECONDARIRY* ON THE KIDNEYS.

Mercury.

CL: III.—MEDICINES WHICH ACT *PRIMARILY* ON THE STOMACH AND PRIMÆ VIÆ, AND *SECONDARILY* ON THE ABSORBENTS.

1. *By diminishing arterial action, and increasing that of Absorption.*
   - 1. *Digitalis.*
   - 2. *Nicotiana.*

2. *By increasing the tone of the Body in general, and that of the absorbent system in particular.*

Bitter Tonics, &c. &c.

3. *By producing Catharsis, and thereby increasing the action of the Exhalants* directly, *and that of the Absorbents* indirectly.

1. *Elaterium.* 2. *Jalap, &c. &c.*

I. OF MEDICINES WHICH ACT PRIMARILY ON THE URINARY ORGANS.

1. *By stimulating the secreting vessels of the kidneys, by actual contact.*

a The substance not undergoing any decomposition *in transitu.*

It is easy to imagine that any substance which is capable of entering the current of the circulation, and of stimulating the kidneys by a direct application to their secerning vessels, may occasion a more copious urinary discharge; in this manner the different saline* preparations, as *Potass*, *Soda*, *Nitrate of Potass*, &c. are brought to the kidneys in the course of the circulation, and exciting the vessels to an increased action, promote the secretion of a larger proportion of watery fluid from the blood, in consequence of which the absorbents are indirectly stimulated in order to supply the deficiency, and in this manner dropsical swellings are reduced.

Water, as a simple diluent, will promote the action of the kidneys, and it is very judiciously remarked by Dr. Cullen, that by withholding the use of fluids in dropsy, you will diminish the quantity of urine secreted, and allow the secretories of the kidneys to fall into a state of inactivity and collapse. This is a sufficient answer to those who defend the practice of enjoining an abstinence of all drinks in dropsy.

b. *The diuretic remedy undergoing decomposition* IN TRANSITU.

The digestive organs appear to possess the power of readily decomposing all saline compounds into which *vegetable* acids enter as ingredients, and of eliminating their alkaline base, which being in the course of the circulation carried to the kidneys, excites them into action, and promotes the excretion of urine; and it is probably in this way that the *Acetate*, *Citrate*, *Supertartrate*, and other analogous combinations of *Potass* and *Soda* prove diuretic; on the other hand, it is equally evident that salts containing the *mineral* acids are not under the control of the decomposing powers of the *chylo-poietic* organs, and consequently do not undergo any changes *in transitu*, although some of these salts, as I have just stated, especially the more soluble ones, are absorbed entire, and prove diuretic. *Sulphate of Potass*, from its insolubility, is not readily absorbed, and its composition will not allow the developement of its base; we perceive therefore that it has not any tendency to produce an influence upon the urinary secretion.

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* Saline bodies would appear to be the peculiar stimuli of these organs, the principal use of which is to separate such saline matter from the blood, which as otherwise accumulate in the system. That these saline diuretics actually pass off by the kidneys, may be satisfactorily shown by an examination of the urine, in which the bodies in question may be chemically detected. Let any person take several doses of Nitre, taking care that the bowels are not disturbed by the medicine, and he will find by dipping some paper into his urine, and afterward drying it, that it will deflagrate, and indicate the presence of nitre.

Certain vegetable bodies likewise appear to occasion diuresis by a similar mode of operation, and it is worthy of notice that these medicines generally contain a bitter principle, which is probably separated by the analysing powers of the stomach; as exemplified in *Scilla maritima; Colchicum autumnale; Lactuca Virosa; Gratiola officinalis; Spartium Scoparium* (Summitates;) *Juniperus communis; Copaifera officinalis* (Balsamum,) &c. The stimulant powers of a bitter vegetable principle upon the *primæ viæ*, have already been fully noticed under the consideration of TONICS, (*page* 106,) and it is reasonable to suppose, that an analogous principle, if introduced into the circulation, may exert a corresponding impulse upon the organs with which it comes into contact.

It particularly merits attention, that the diuretic operation of any body that acts by being absorbed, is at once suspended, if catharsis follows its administration, whether in consequence of the largeness of its dose, its increased solubility, or from the effect of its combination with some purgative; for it is a law, *that the processes of assimilation, and absorption from the duodenum, are arrested, or very imperfectly performed during any alvine excitement;* the different effects of the saline compounds of the alkalies with tartaric acid, elucidate the truth of this law in a very striking manner—thus, *Super-tartrate of Potass*, or Cream of Tartar, in well-regulated doses, acts, as we all know, upon the kidneys; the tartaric acid being, as I suppose in this case, abstracted and assimilated by the digestive process, and at the same time the alkaline base (Potass) eliminated, and subsequently carried into the circulation; but if we increase the solubility of the compound, by reducing it to the state of a neutral tartrate (*soluble tartar*,) or by combining it with *Boracic acid*, or some body that has a similar effect; or what is equivalent to it, if we so increase the dose* of the *cream of tartar*, that full catharsis follows its administration, then diuresis will not ensue, since no decomposition can take place under such circumstances, nor can it be carried by absorption into the circulation. *Nitre* and those salts which are carried to the kidneys without previous decomposition *in transitu*, are subject to the same law; for, if we combine them with purgatives, their presence can no longer be recognised in the urine, as I have ascertained by experiment. *Oil of Turpentine* in doses of two fluid-drachms, may so excite the urinary organs as to produce even bloody urine; whereas a fluid-ounce will scarcely occasion any apparent influence upon those functions, because the increased dose acts upon the bowels, and consequently prevents its passage into the circulation.

Sulphate of Magnesia does not readily produce any diuresis, because it operates upon the bowels, but the experiments of Vitet and Bracy Clarke have shown, that if this saline compound be administered to the horse, whose bowels are not easily affected by purgatives, it acts powerfully upon the kidneys;† and I will take occasion in this place to observe that, on account of this inirritability of the bowels of the horse, diuretic medicines are more certain in their operation, than in the human subject; a fact, which, in itself, shows the importance of attending to the state of the bowels, during a course of those diuretics which require to be absorbed before they can produce their specific effects.

Equally necessary is it to attend to the state of the vessels of the skin, for if during the administration of a Diuretic, these vessels be excited by external warmth, its action may be diverted from the urinary organs to the exhalants on the surface, and occasion diaphoresis; but if the surface of the body be kept cool, this diversion will not occur; so greatly indeed does this cooling the surface determine to the kidneys, that the usual diaphoretic medicines may, by an attention to this circumstance, be converted into powerful diuretics.

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* The *Secondary* Diuresis which sometimes takes place under such circumstances, and succeeds Catharsis, may offer an apparent exception to this law; but this must not be confounded with that which is the result of a *Primary* action upon the urinary organs by the absorption, and consequent contact, of a specific Stimulant.

† Certain mineral waters, containing cathartic salts in a state of extreme dilution, if insufficient to excite the bowels, sometimes pass off by the kidneys; an effect which can always be prevented by accompanying their exhibition with some laxative.

C. II. MEDICINES WHICH ACT *Primarily* ON THE ABSORBENTS, AND *Secondarily* ON THE KIDNEYS.

It has been shown, in the former division, that by increasing the action of the kidneys, we diminish the quantity of water in the blood, and consequently occasion an extraordinary action of the absorbents to supply the deficiency, whence dropsical accumulations disappear: it remains to be stated that an operation, which may be considered the converse of the one just described, is not unfrequently established: the absorbent vessels, in this case, are first roused to extraordinary action, and the blood therefore becomes surcharged with serous matter, in consequence of which the kidneys are stimulated, and it is eliminated through the urinary passages: so that in the former case the absorbent may be said to be called into activity by the kidneys, while in the latter, the kidneys are obviously subservient to the increased energy of the absorbent system. The preparations of Mercury are perhaps the only medicinal bodies which we can strictly consider as specific stimulants to the absorbent system; and of their power in directly acting upon these organs there are such ample proofs, that it is unnecessary to adduce any additional evidence upon the subject. In instances of increased absorption from the agency of other medicines, the effect must be considered as rather arising from their *secondary* than primary operations; the most important of which will constitute objects of inquiry in the succeeding divisions of the subject.

C. III. MEDICINES WHICH ACT *Primarily* ON THE STOMACH OR SYSTEM, AND *Secondarily* ON THE URINARY ORGANS.

A Diuretic effect is very frequently occasioned by substances which act on the stomach and *primæ viæ*, producing a peculiar state of these organs, which *sympathetically* affects the whole body, and more particularly the absorbent system, and the vessels concerned in the secretion of urine from the blood. As this primary influence upon the stomach, and the effects to which it gives rise in remote parts, are very different in their character, according to the nature of the remedy employed, and the state of the system at the time of its administration; the present attempt to investigate and generalize these relations, and to adopt them as the basis of a classification, may ultimately lead the practitioner to some distinctions of practical utility.

1. *By diminishing Arterial Action and increasing that of Absorption.*

It would appear that the action of the vessels employed in the circulation of the blood, and the energy of the absorbents are, to a certain extent, antagonist powers; the experiments of Majendie demonstrate that the absorption of a poisonous substance is retarded by a plethoric, and accelerated by a depleted state of the sanguineous system; the fact is practically established by numerous phenomena in pathology. Dr. Blackall has very satisfactorily shown the existence which subsists between increased arterial action and diminished absorption. Hence it follows that remedies capable of controlling the circulation may affect the activity of absorption, increase diuresis, and cure dropsy; in this manner the *Digitalis Purpurea* acts as a sorbefacient, and it may be remarked that it seldom or never produces its diuretic effects, without a concomitant reduction of the frequency of the pulse; its power too appears only when it is administered in dropsy; in a state of health it will reduce the pulse, but not increase the discharge of urine. Tobacco has also somewhat analogous powers in promoting absorption, and its operation is accompanied with a corresponding depression of vascular action. Venesection, upon the same principle, may occasion, in certain cases of dropsy, a discharge of the accumulated fluid.

2. *By increasing the tone of the Body in general, and that of the Absorbent System in particular.*

That diminished absorption, and the consequent accumulation of serous fluids in the cellular texture, and different cavities, frequently depends upon general debility is very obvious, and in such cases, those remedies alone which are capable of renovating the vigour of the body can prove of any signal service. Dr. Blackall presents us with an illustrative case of this nature, on the authority of Mr. Johnson of Exeter, in which the tonic powers of well-fermented bread occasioned in the space of a few hours an effect so powerfully diuretic, as to have cured the sailors on board the Asia East Indiaman, who had been attacked with Dropsy, in consequence of the use of damaged Rice. Dropsy is a most common consequence of the operation of all powerfully debilitating causes; hence fevers, whether of the intermittent or continued kind, which have been long protracted, are followed by *œdematous* swellings: in states of extreme debility the exhalant vessels would seem, from their laxity, to permit the thinner parts of the blood to pass too readily through them; this is proved by the circumstance that palsied limbs, in which such a laxity may be presumed, are frequently affected with *œdema*, and the truth of this explanation is further corroborated by the advantages which occur in such cases from the mechanical support of pressure from bandages.

3. *By producing Catharsis, and thereby increasing the action of the Exhalants* directly, *and that of the absorbents* indirectly.

It has been already stated, under the consideration of Cathartics, that certain medicines of that class excite the exhalants of the alimentary canal, and occasion a very copious discharge of serous matter: by this operation the blood is deprived of a large portion of water, and the absorbents are thus indirectly stimulated to supply the deficiency; *Elaterium*, and some other *hydragogue* cathartics, may be thus employed with extraordinary success for the cure of certain forms of Dropsy, where the vital powers of the patient can sustain the violence of the remedy;—in the whole circle of medicinal operations there is nothing more wonderful than this, that an impression made on the internal surface of the *primæ viæ*, by a few particles of matter, should thus convey by magic as it were, an impulse to the most remote extremities, rousing their absorbents to action; and, in case of *œdema* there, awakening the sleeping energies of these vessels, which, like millions of pumps at work, transmit the morbid fluid to the intestines and urinary passages, effecting a detumescence of the hydropic limbs in the course of a few hours, and thus affording a striking illustration of the sympathetic action of medicines, and an instructive example of the operation of those of the sorbefacient class.*

The observations which I have thus offered will lead the practitioner to select the particular diuretic which is best calculated to fulfil the indications of each individual case; and they will at the same time point out those which cannot be administered in combination, without a violation of the law of medicinal compatibility. With respect to the general efficacy of these medicines it may be stated, that where the disease originates from *organic* affections of the chylopoietic viscera, it will not be cured by the mere evacuation of the water by diuretics; but that where it has taken place from diminished absorption, these remedies may be reasonably expected to effect a cure.

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* See *Sir Gilbert Blane's Medical Logic. Edit.* 2. *p.* 190.

DIAPHORETICS.

The term *Diaphoretic* has been applied to those medicines which increase the natural exhalation of the skin, and when they act so powerfully as to occasion sweating, they have been commonly distinguished by the name of *Sudorifics*, but as no difference exists between these remedies, but in the degree of force with which they act, we may very properly comprehend the whole under the general title of Diaphoretics: the fluid effused is also in both cases similar, but in the one it is discharged more slowly, and is carried off by the conducting* power of the air, in the insensible form of vapour, while in the other case it is so copiously effused from the exhalant vessels, as to appear in the liquid form.

Diaphoretic medicines operate either by directly stimulating the exhalant vessels of the skin, or by exciting the vascular system generally; in some cases these effects take place singly, in others they occur in conjunction, and the operations do not appear to be generally incompatible with each other.

In conformity with the plan adopted in the present inquiry, I shall proceed to consider the powers of this class of medicines in relation to their different modes of operation.

DIAPHORETICS.

Occasion their effects—

I. BY INCREASING THE ACTION OF THE CUTANEOUS VESSELS.

a. By external application.

The *Stimulus of Heat*.

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* The cutaneous discharge is very materially modified by the state of the atmosphere, in its relations to moisture and dryness: when the air contains much moisture it is a bad conductor of the perspirable matter, which therefore, instead of being carried off in an insensible form, is condensed upon the surface; hence we appear to perspire greatly upon the slightest exercise, whereas the cuticular discharge is at such times absolutely less. We have all experienced the sensation of heat, and disposition to sweating, during the moist weather which so frequently occurs in this country in April and May, the wind being at the time stationary at southwest or south. On the contrary, during the prevalence of an east wind, the most violent exercise will scarcely prove diaphoretic, and yet the quantity of cutaneous exhalation is far greater than during that state of atmosphere when the slightest exercise deluges us with perspirable matter.

b. By medicines that enter the circulation, and stimulate the cutaneous vessels *by contact.*

Mercurial Preparations.
Sulphur.
Saline Diaphoretics.

c. By acting on the surface, sympathetically, through the medium of the Stomach.

Cold Potations.
Antimonials,
&c. &c.

II. BY INCREASING VASCULAR ACTION,

Violent muscular exercise.
Carbonate of Ammonia.
Guaiacum.
Alcohol, &c. &c.

The action of the cutaneous vessels may be augmented by different means; external heat, being directly applied to them, must necessarily occasion increased action; hence it is, in itself, often sufficient to produce sweating; and it generally accelerates the operation of sudorific medicines. To this general rule, however, there are some very important exceptions, and indeed in certain conditions of the surface the stimulus of heat will be found to impede, rather than to promote diaphoresis; thus, in the hot stage of a continued fever, there exists a peculiar constriction of the cutaneous vessels, accompanied with extreme heat and dryness of the surface—a state which is uniformly increased by the application of external heat, and relieved by that of cold; and paradoxical as it may appear, *cold* under such circumstances is the only efficient sudorific; the reports of Dr. Currie have established this fact beyond the reach of controversy. *Saline diaphoretics*, as they readily pass with the chyle, may enter the circulation, and be thus brought to act directly on the cutaneous vessels; at the same time it is probable that they may also occasion an action on the stomach, which is sympathetically communicated to the vessels of the skin: 'they have little or no influence on the vascular system, and neither augment the force nor velocity of the circulation. Although the external application of cold was not often employed in the hot stage of fever until within the last thirty years, yet the administration of cold drinks appears to have been practised by the ancients as an expedient to produce perspiration. Galen and his immediate disciples, as well as the physicians of the sixteenth century, seem to have frequently administered cold water for the purpose of exciting sweat in fevers.* Celsus describes the beneficial effects which arise from copious draughts of cold water in ardent fevers, "fereque post longam sitim et vigiliam, post multam satietatem, post infractum calorem, plenus somnus venit, per quem *ingens sudor effunditur*, idque præsentissimum auxilium est."† Cold water, when introduced into the stomach in the hot stage of fever, must produce its diaphoretic effect through the sympathetic relation which exists between that organ and the skin. Nauseating doses of *Antimony* and of other emetics occasion relaxation of the skin from the same mode of operation, and in this latter case, if the force of the circulation be at the same time increased by tepid diluents, the diaphoretic effect is more certain and considerable. *Alcohol*, *Guaiacum*, and other stimulants, produce their effects by merely accelerating the circulation; and in employing such remedies for the purpose of exciting sweat, we must be careful to adapt them to the circumstances of the case, and to the degree of debility which prevails; in all febrile diseases attended with much increased heat, or connected with local inflammation, diaphoretics of this kind must be carefully avoided, for by accelerating the circulation, they would counteract any benefit which they might confer by relaxing the vessels of the skin.

As evacuating the serous part of the blood has an indirect effect in promoting absorption, Sudorifics have been occasionally exhibited in dropsy, especially in that form of the disease called *Anasarca*. It has been already observed, that cases too frequently occur in which the discharge of urine cannot be increased by art; upon such occasions practitioners have sometimes had recourse to a trial of Sudorifics, as being less liable to debilitate than the other alternative of a drastic purgative. By determining to the surface, and producing a gentle diaphoresis, these remedies are useful in various diseases, such as dyspepsia, diarrhœa, asthma, and chronic rheumatism; and from the influence which they exert upon the extreme vessels of the skin, they are highly serviceable in various obstinate cutaneous affections, as herpes, lepra, &c.

The increased efficacy which these medicines derive from combination with each other, will form a subject of inquiry in the succeeding essay.

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* *Lommius de Febribus.*

† *De Medicina, Lib.* iii. *c.* 7.

EXPECTORANTS.

Medicines which are supposed to be capable of facilitating the excretion of mucus from the breast, *ex pectore*, that is, from the trachea, and cells and passages of the lungs.

If the term *Expectorant* be intended to express a medicinal substance, which has the power of promoting the expulsion of fluid from the lungs, by some *specific action* on the parts concerned, we can have no hesitation in at once rejecting the word, and denying the existence of such remedies; if however the term be received, conventionally, as comprehending all those substances which are capable, according to the state of the system in each particular case, of producing expectoration, it will be extremely proper to recognise, and practically useful to retain such a class of Medicinal agents. In order that their *modus operandi* may be correctly understood, the following classification is submitted to the reader.

A CLASSIFICATION OF EXPECTORANTS,

According to their supposed Modes of Operation.

CL: I.—MEDICINES WHICH INCREASE PULMONARY EXHALATION, AND THEREBY DILUTE THE MUCUS IN THE FOLLICLES OF THE LUNGS.

a. By removing constriction of the Pulmonary Exhalant vessels.
Nauseants.

b. By stimulating these vessels by the *actual contact* of a medicinal substance.
Allium. *fœtid Gums.*
Scilla?
The different Balsams.

CL: II—MEDICINES WHICH DIMINISH THE INORDINATE FLOW OF FLUID INTO THE LUNGS, AND RENDER THE EXPECTORATION OF THE REMAINDER MORE EASY.

a. By removing the debility of the Exhalants.
Sulphate of Zinc. *Bitter Tonics.*

b. By increasing the power of the Absorbents.
Digitalis. *Nicotiana.*

c. By determining to the skin by gentle diaphoresis.
Tartarised Antimony.

d. By exciting serous discharges from the bowels.
Saline Purgatives.

CL: III.—MEDICINES WHICH OPERATE MECHANICALLY IN PROMOTING THE REJECTION OF ACCUMULATED MUCUS.

a. By stimulating the muscles of respiration.

Ammonia.

b. By exciting Vomiting, and thereby compressing the thoracic viscera.

Emetics.

I. Of Medicines which increase Pulmonary Exhalation.

a. By removing constriction of the Pulmonary Exhalant vessels.

There can be no doubt but that, in certain states of disease, the exhalants of the lungs, like those of the skin, are affected by a spasmodic constriction, in consequence of which the usual quantity of fluid for the lubrication of these parts, is not effused, whence a train of morbid phenomena arise; this appears to happen in *Pneumonia*, *Asthma*, and certain other diseases of the pulmonary organs. In order to remove such a constriction, remedies of the Antispasmodic class may be exhibited with advantage; nauseating doses of Tartarized Antimony, or of Ipecacuanha, are likewise calculated to fulfil the same indication, by an operation analogous to that by which Diaphoresis is produced.

b. By stimulating the Pulmonary Exhalants, by the actual contact of a medicinal substance.

There certainly appears to be substances which enter the circulation, and are more peculiarly determined to the pulmonary vessels, since their odour is to be distinctly recognised in the air that is expired. *Garlic* may be adduced as an example of this kind; so penetrating is its odorous principle, that if it be only applied to the soles of the feet, it may be perceived in the breath. Such substances may stimulate the exhalant vessels through which they pass, and by this stimulus the secretion may be increased, and the mucus contained in the follicles diluted, so as to be poured out in a less viscid form, and consequently in a state to be more easily brought up by expectoration.

II. OF MEDICINES WHICH DIMINISH THE INORDINATE FLOW OF FLUID INTO THE LUNGS.

a. By removing the debility of the Exhalants.

It not unfrequently occurs in persons either debilitated by age or disease, that the exhalant vessels of the lungs lose their tone, and pour out a larger quantity of fluid than is necessary for the lubrication of these organs; this is particularly observable in the disease called *humoral asthma*, and in the catarrh of old persons: if this excess be restrained by strengthening the tone of the system generally, or by astringing these vessels in particular, the expectoration of the remainder will be rendered much more easy: according to my experience, *sulphate of zinc* displays considerable powers in moderating this effusion of fluid, and it appears to produce this effect by increasing the tone of the exhalant vessels of the lungs; several medicines also, which are included in the former division of this classification, may, by stimulating these organs, not only promote the exhalation when it is too scanty, but repress it when it is too abundant.

b. By increasing the power of the Absorbents.

In some cases, the mucous inundation may not depend upon any fault in the exhalants, but upon a torpid state of the pulmonary absorbents: our remedy for this evil is to be found among that class of medicines which have the power of promoting absorption, as small doses of some mercurial preparation, *Digitalis*, and perhaps *Nicotiana*, &c.

c. By determining to the skin by a gentle diaphoresis.

It is evident that an increase of the cutaneous exhalation is generally attended with a relative diminution in the other serous excretions of body; this is so obvious with respect to our urinary discharge, that every person must have noticed the variation of its quantity at different seasons of the year; in like manner the exhalation from the lungs, although less capable of becoming an object of observation, is not less affected by the state of the cutaneous discharge; hence medicines capable of promoting it, are calculated to diminish the quantity of serous exhalation from the lungs; and it is upon this principle, that well-regulated doses of the compound powder of Ipecacuan, frequently furnish the oppressed asthmatic with a valuable resource.

d. By exciting serous discharges from the bowels.

Upon the principle announced in the preceding section, the operation of a saline cathartic may relieve the pulmonary organs when loaded with a preternatural accumulation of fluid, and consequently assist expectoration. On the contrary, if the exhalation be deficient, this class of remedies may increase pulmonary irritation, and check expectoration, a fact which coincides with the concurrent testimony of many able practitioners.

III. OF MEDICINES WHICH OPERATE MECHANICALLY.

a. By imparting vigour to the respiratory muscles, engaged in the act of expectorating.

It must be admitted that, to a certain extent, expectoration is a voluntary operation, connected with the action of a variety of muscles, which in a state of extreme debility are not easily excited into action: every practitioner must have noticed this fact during the treatment of the coughs of exhausted patients, and have witnessed the distress necessarily arising from it; in this condition the exhibition of a stimulant may so far renew the exhausted excitability of these organs as to enable them to undergo the necessary exertions.

b. By compressing the thoracic viscera, through the operation of an emetic.

The beneficial results which frequently attend the concussion of an emetic, in cases of mucous accumulations in the lungs, are too well known and understood to require much elucidation: in the act of vomiting the thoracic viscera are violently compressed, the neighbouring muscles are also called into strong action, and both expiration and inspiration are thus rendered more forcible, and the expulsion of mucus from the cavity of the lungs necessarily accomplished.

The safety and expediency of such a resource must, however, in each particular case be left to the discretion of the medical practitioner.

Besides the remedies above enumerated, there are some others which afford relief in certain coughs, and have therefore, in popular medicine, been considered as *Expectorants;* but their operation, if they exert any, is to be explained upon principles altogether different from that of facilitating expectoration, and will more properly fall under the head of *Demulcents*.

Atmospheric changes, in relation to moisture and dryness, deserve some notice before we conclude the history of expectorant agents; the subject teems with curious and important facts, and the advantages which the asthmatic patient derives from such changes merit farther investigation. That the lungs are constantly giving off aqueous vapour is made evident by condensing the expired air on a cold surface of glass or metal; and it is easy to imagine that when the atmosphere is saturated with moisture, its power of conducting off this vapour will be proportionally diminished, and that an accumulation of fluid may thus take place in the lungs; on the other hand, we may suppose the air to be so dry as to have an increased capacity for moisture, and to carry off the expired vapour with preternatural avidity; in either of these cases, the excretions from the lungs will be materially influenced, whether to the benefit or disadvantage of the patient, will depend, in each particular instance, upon the nature of the disease under which he suffers. I have known a person who could breathe with more freedom in the thick fogs of the metropolis than in the pure air of a mountainous region, and it would not be difficult to adduce many examples in illustration of a diametrically opposite constitution of the pulmonary organs.

From the same cause we may frequently observe remarkable changes occur in the character of a cough, at the breaking up of a frost; in some cases the expectoration will be checked, and in others promoted by a sudden change from a dry to a moist atmosphere. Can a more instructive illustration be offered of that important fact, which I have been labouring in every page to impress upon the mind of the young practitioner, that *remedies are only relative agents?*

SIALOGOGUES.

Substances which increase the salivary[*] discharge. This class comprehends two orders of medicines, viz.

1st. Those which increase the salivary excretion by *external* application to the secreting vessels, or by mastication, as the following acrimonious and pungent substances, *Anthemis Pyrethrum; Cochlearia Armoracia; Daphne Mezereum; Nicotiana Tabacum*, &c.

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[*] σιαλος *saliva*, et αγω *excito*.

2d. Those whose *internal* exhibition affects these organs through the medium of the circulation, of which *Mercury* is the only example; for all the preparations of this metal, when administered in certain quantities, produce salivation.

The acrid Sialogogues, or masticatories, by stimulating the excretory ducts, and increasing the secretion of saliva, sometimes relieve the pain of toothach, and are commonly resorted to for that purpose; they are besides supposed capable of relieving other congestions, or inflammatory dispositions, in more remote parts of the head, by the derivation they occasion from the neighbouring vessels, especially the branches of the external carotid.

Mercury, in its metallic state, is perfectly inert, and does not exert any influence whatever upon the living body: this fact is sufficient, if any serious refutation were necessary, to overturn the theory which attributes its sialogogue property to the gravity of its particles, by which "it is disposed to retain the *direct line* in which it is propelled from the heart, and is therefore more certainly determined to the vessels of the head." It has been also supposed to act by diminishing the *lentor* of the blood, and disposing it to pass more easily into the salivary glands, so as to increase their secretion: equally gratuitous and improbable are the chemical hypotheses which have been offered to explain this curious and singular property; Dr. Cullen endeavoured to solve the problem, by supposing that "*Mercury has a particular disposition to unite with ammoniacal salts, and that such salts are disposed to pass off by the salivary glands more copiously than by any other excretion.*" Dr. Murray, however, very justly remarks that mercury has not any peculiar tendency of this kind; and that if it had, these salts are not more abundant in the saliva, than in some other secretions. Dr. Murray then proceeds to submit a theory which he considers better calculated to explain the phenomenon; he observes, that the urine appears more peculiarly designed to convey matter which has been received into the circulating mass, but which is still excrementitious, from the system. To pass, however, with this fluid, it is necessary that the matter conveyed should be soluble in it; and when it is so, we can discover it in the secretion by chemical tests. If there is any property connected with it, therefore, which shall prevent this solubility, it probably will prevent the substance from being secreted. Now, the *phosphoric acid*, abundant in urine, must in this mode counteract the secretion of mercury in any form of preparation, by forming with it a compound insoluble, and to which the slight excess of acid cannot communicate solubility; the mercury, therefore, existing in the circulating mass, when brought in the course of the circulation to the secreting vessels of the kidneys, will not pass through their whole course; but if conveyed so far as to be combined with *phosphoric acid*, will, from this combination, be incapable of being conveyed onwards, and will therefore be retained in the composition of that part of the blood which does not enter into the secretion, but returns into the circulation. It must be discharged by some other emunctory; a portion of it appears, from some facts, to pass off by the insensible perspiration; but the tenuity of this secretion, if the term may be employed, must be unfavourable to this mode of discharge. The salivary secretion is one by which it may be more easily transmitted; and this transmission may even be facilitated by the affinity exerted to the *Oxide of Mercury* by the *Muriatic Acid*, the *Soda*, and *Ammonia*, which are the chief saline ingredients in saliva; for it deserves to be remarked that triple compounds of these substances, are, to a certain extent, soluble in water; and if the *Mercury* is thus secreted, it will of course stimulate the secreting vessels through which it passes, and increase the discharge.

Sir Gilbert Blane* has lately advanced another hypothesis to account for the effects of mercury as a sialogogue; he considers the salivary glands as one of the outlets for the *ramenta* of the bones, for by analyzing the saliva we discover the principles of which they consist; indeed the osseous matter not unfrequently concretes on the teeth, and sometimes on the salivary ducts, in the form of what is called *Tartar*: "does not this fact," says Sir Gilbert Blane, "in some measure account for these glands being the parts upon which determination is made by the operation of mercury, which consists in exciting an active absorption of solid parts, as I have elsewhere observed."†

But do not the kidneys, and other excretory glands also furnish outlets, through which the *detritus* of the body is eliminated. How does it happen, therefore, that the kidneys are not as equally affected as the salivary glands, by the action of mercury? In the present state of our knowledge it will be more prudent to rest on the phenomenon as an ultimate fact, than in attempting to ascend higher in the scale of causes, to involve ourselves in impenetrable darkness.

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* Medical Logic, Edit. 2. p. 75.

† Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. III. p. 119. London, 1812.

During the prevalence of the theory which attributed to *Nitric acid* all the anti-syphilitic powers of mercury, it was even maintained that this acid also excited ptyalism; experience however has disproved the effects thus attributed to it, and no one attempts to support its pretensions, as a sialogogue, except indeed as it may perchance, by its acrid qualities, influence the excretory ducts of the glands, externally, in the act of being swallowed.

It has very lately been stated by Dr. Macleod,* that the *Hydro-cyanic acid* occasionally produces soreness of the gums, and a disposition to ptyalism; this, if true, is a very remarkable fact, and well deserves attentive consideration.

ERRHINES, or STERNUTATORIES.

Substances which, by direct application to the pituitary membrane, occasion a discharge from the nostrils either of a mucous or serous fluid. This class contains several different species, whose operation varies in intensity, as well as in duration.

Errhines have been regarded as useful in consequence of the evacuation they occasion, but in this respect their value has been greatly overrated; it has been stated, that they diminish the quantity of fluid circulating in the neighbouring vessels, and even extend their influence to all the branches of the external carotid; and Dr. Cullen says that he has, apparently from this operation, known headach, pain of the ear, and some cases of ophthalmia, cured or relieved by the use of Errhines. There can be no doubt that local stimulants of this kind will frequently remove pain from the head and neighbouring parts, but not by occasioning any vascular depletion, as Dr. Cullen supposed, but by a stimulant operation conveyed through the the medium of nervous communication, or contiguous sympathy.

Dr. Cullen has moreover supposed, that these substances may be useful in preventing apoplexy or palsy. Morgagni† however relates a case in which sneezing induced a fatal attack of this disease; and Van Swieten‡ has satisfactorily shown, that continued paroxysms of sneezing tend to load the vessels of the head with blood; for the violent contraction of the chest impedes for a time the passage of the blood through the lungs, and therefore obstructs the return of the venous blood from the brain, the vessels of which are in consequence greatly distended; the face therefore reddens and becomes turgid, the eyes are suffused with water, and appear full and distended. Its occasional dangerous violence is said to have been the cause of the benediction so universally bestowed on those who sneeze.*

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* Medical and Physical Journal for October, 1821.

† De Sed. et Caus. Mord. Epist. xiv. art. 27.

‡ Comment. ad. Aph. 271.

EPISPASTICS.

External applications which produce a serous or puriform discharge, by exciting a previous state of inflammation.

The effects of the common blistering fly may serve to illustrate the *modus operandi* of these agents. The extreme blood-vessels are excited into increased action, inflammation is occasioned, and the exhalants pour out a thin serous fluid which separates the cuticle from the true skin, and forms a vesicle or blister. Hence the *primary* effects of such applications must be considered as stimulant, although they may occasion an effect, *secondarily*, in consequence of the serous evacuation which they occasion. It is now generally admitted that diseased action may frequently be superseded by establishing a different action in the part, or in its vicinity: upon this principle a blister applied to the side will often cure pleurisy; it excites a new action which, by virtue of *contiguous sympathy*, relieves that upon which the disease depends. The same principle regulates the application of epispastics, in hepatitis, phrenitis, angina, pneumonia, rheumatism, and the other species of active inflammation. Dr. Murray has justly observed, that a similar principle exists with respect to the pain excited by blisters, which may also be applied to the explanation of the advantages derived from them in other diseases. It has long been remarked, that exciting one pain often relieves another, and hence blisters afford relief in toothach, and other painful affections. Epilepsy and hysteria, arising from irritation, have been removed by blisters; apparently from their exciting pain, and diminishing the sensibility to irritation.

Such are the effects of epispastics, arising from local irritation; they are, moreover, capable of exerting a stimulant operation on the general system,† and of raising the vigour of the circulation; hence in fevers of the typhoid type, where extreme debility prevails, they not unfrequently prove valuable auxiliaries. See *Cantharides*.

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* This is one of the most ancient superstitions which has been transmitted to us. It was customary in Greece, when any one sneezed to exclaim *Ζῆθι*, *May you live;* or Ζευ σῶσον, *God bless you.* Aristotle in his problems has attempted to account for its origin, but unsatisfactorily, and Pliny (*Nat. Hist. lib.* 28. *c.* 2.) *asks* "*cur sternutantes salutentur?*"

† It is said that whenever Dunning, the celebrated barrister, was called upon to make the finest display of his eloquence, whether forensic or parliamentary, he constantly applied a blister to his chest, which he found to have

When these agents act so mildly as merely to excite inflammation, without occasioning the effusion of any serum, they are denominated Rubefacients. *See Linimenta.*

III. OF CHEMICAL REMEDIES.

There is no principle in physiology better established than that which considers vitality as a power engaged in continual conflict with the physical, chemical, and mechanical laws, to which every species of inanimate matter is invariably subject. Every phenomenon of the living body might be advanced in illustration and support of this general position. The animal machine is constantly surrounded and assailed by agents, whose elective attractions for the principles of which it consists, are so numerous and energetic, that its decomposition would inevitably, and speedily result, were not the adhesion of its molecules maintained by the conservative influence of a superior power. The compositions and decompositions which manifest themselves in the elaborate operations of chylification, sanguification, and secretion, are carried on by agencies totally distinct from those which govern the combinations of inert matter, and must be investigated upon principles essentially different. How then can a medicinal substance be brought to act *chemically* upon the living body? Notwithstanding the general proposition, that the animal processes to which we have alluded, are governed by laws peculiar to life, yet it must be admitted that such processes are occasionally influenced,*

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the effect of imparting an unusual tone and vigour to his body, and elevation to his mind.

* It sometimes happens that the stomach and digestive organs are so weakened by disease as to lose their control, or what Dr. Fordyce called their *governing power*, in which case they would appear to be unable to prevent the matters which they contain from acting chemically upon each other, and occasioning decompositions and new combinations: in such cases substances are sometimes developed in the internal organs by the action of disease, which are capable of producing a chemical effect upon the fluids; for instance,—an acid is not unfrequently generated in the bowels of children, which decomposes the bile and produces a green precipitate, and green stools are the consequence; in other cases the acid combines with the *Soda* of the bile, and the precipitate thus occasioned is thick, viscid, very bitter, and inflammable, and we have stools looking like pitch. In Yellow Fever, and in several other diseases, the bile which is brought up by vomiting is frequently of a vivid green colour, and some writers have attributed the phenomenon to a morbid condition, or action of the liver or gall bladder; the fact however is, that the bile itself undergoes a chemical change in the Duodenum and Stomach. That bile does undergo such a change from decomposition, is

modified, and controlled by powers strictly chemical in their operation; although in most cases it will be seen that such effects afford only apparent exceptions to the general law: for several of the remedies whose operations have been regarded as purely chemical, exert their influence on parts which cannot be strictly considered under the control of the living principle; of which *Antacids*, and certain *Antidotes* and *Antiseptics*, to be hereafter explained, may be considered as examples: while others destroy the vitality of the organ before they can produce any change in the matter of which it is composed, as the action of *Escharotics* very clearly demonstrates.

REFRIGERANTS.

Substances which directly diminish the force of the circulation, and reduce the heat of the body, without occasioning any diminution of sensibility or nervous energy.

These remedies may be considered either as external and local, or as internal and general. In the first case, there will not be much difficulty in substantiating their claims to be considered *Chemical Agents*, but in the latter case, the theory of their operation is unsatisfactory and obscure; and even the facts, which are adduced to establish the existence of such a class of remedies, are of a very problematical character.

Topical Refrigerants. In the case of external inflammation, refrigeration may be produced by the application of cold substances, such as water, ice, or certain saline solutions, or by the abstraction of heat by means of evaporation, which is very effectually accomplished by the use of lotions composed of spirit or ether. By these methods we are capable of directly diminishing the activity of the vessels of the part; thus, in burns and scalds, the pain is instantly relieved, and the inflammation effectually reduced.

Internal Refrigerants. There are certain saline substances which, by undergoing a rapid solution, and acquiring an increased capacity for caloric, produce a diminution of temperature, and if this take place in the stomach, the sensation of cold which it will produce is equivalent to a partial

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proved by a variety of facts observed to take place out of the body; it is well known, for instance, that the fæces of infants, although yellow when voided, frequently become green after some time, and Dr. Heberden observes in his Commentaries, that the urine of a certain jaundiced patient, which was of a deep yellow, became after a few hours green, in such cases it is probable that an acid is generated by the reaction of the elements of which the bile consists.

abstraction of stimulus; which, being extended by sympathy to the heart, occasions a transient reduction in the force of the circulation, and by this or by a similar sympathetic affection, causes a sensation of cold over the whole body; in this manner Dr. Murray explains the refrigerant operation of nitre, which after all is of a very doubtful nature. We shall perhaps not feel much difficulty in accepting this theory, and in allowing that general refrigerant effects may be temporarily produced, by occasioning an impression of cold upon the stomach. The theory which is proposed to explain the refrigerant operation of vegetable acids and certain other substances, and which we have now to consider, is derived from those chemical views respecting animal heat, in which the consumption of oxygen in the act of respiration is considered the principal source. Dr. Murray,* who has given a luminous exposition of this theory, says, "it is established by numerous experiments and observations, that the quantity of oxygen consumed in the lungs is materially influenced by the nature of the ingesta received into the stomach. When the food and drink are composed of substances which contain a small proportion of oxygen, it is known that the consumption of oxygen in the lungs is increased, and this even in a short time after the aliment has been received; thus Mr. Spalding, the celebrated diver, observed, that whenever he used a diet of animal food, or drank spirituous liquors, he consumed in a much shorter time the oxygen of the atmospheric air in his diving-bell; and therefore he had learned from experience to confine himself to a vegetable diet, and to water for drink, when following his profession. During digestion too, it was established by the experiments of Lavoisier and Seguin, that a larger proportion of oxygen than usual is consumed.

But it is known that the animal temperature is derived from the consumption of oxygen gas by respiration; and that an increase in that consumption will occasion a greater evolution of caloric in the system, and consequently an increase of temperature in the body, while a diminution in the consumption of oxygen will have an opposite effect. If, then, when the temperature of the body is morbidly increased, we introduce into the stomach substances containing a large proportion of oxygen, especially in a loose state of combination, we may succeed in reducing the general temperature. This we accomplish in part by a vegetable diet, but still more effectually by the free use of the *Acids*. The vegetable acids in particular, which are found by experience to be the best refrigerants, are readily acted upon by the digestive powers, and assimilated with the food; and as the large quantity of oxygen which they contain is already in a concrete state, little sensible heat can be produced by the combination of that element with the other principles of the food. The nutritious matter which is received into the blood, containing thus a larger proportion of oxygen than usual, will be disposed to abstract less of it from the air in the lungs, and consequently less caloric will be evolved; the temperature of the body will be reduced; and this, again operating as a reduction of stimulus, will lessen the number and force of the contractions of the heart."

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* System of Materia Medica, vol. 1. p. 453.

Such is the philosophical web which chemical ingenuity has woven for us,—the device is beautiful, but the fabric will be found too frail to endure the touch. The experiments of Dr. Crawford, in proof of the chemical origin of animal heat, are highly ingenious and plausible, but it is now generally admitted that the temperature of animals depends upon the living principle* which animates them, and that although the absorption of oxygen, in the act of respiration, may directly contribute something to its production, yet that its chief action is that of serving as a stimulus to the living power in generating it; for, as Sir Gilbert Blane† remarks, oxygen plays an interesting and active part as an exciting power throughout all nature, both animate and inanimate. If the heat of the body depended on respiration alone, any one might, by a voluntary effort of quick, deep, and prolonged respiration, increase the temperature of his body at will; the effect also of the emotions of the mind, in generating both heat and cold, adds Sir Gilbert, is proof sufficient of temperature depending on a vital and not on a chemical cause.

ANTACIDS.

Remedies which obviate acidity in the stomach, by combining with the acid, and neutralizing it.

This is the most decided instance of chemical action which occurs in the history of medicinal operations. We have an acid whose presence excites morbid symptoms in the *primæ viæ*, and these are immediately removed by the administration of any one of those substances which is capable of forming a neutral compound with the acid in question, *out of the body*, and the same proportions are required in both cases for saturation. If a carbonated alkali be employed, the same disengagement of carbonic acid takes place in the stomach as would occur in the laboratory, and a new compound is produced, whose operation varies according to the chemical nature of the substance employed; thus, the salt which magnesia forms with the acid in the stomach proves slightly purgative; while that which lime produces under similar circumstances is distinguished by an opposite property.

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* See a paper upon this subject by Mr. Brodie, *Phil. Trans.* 1811.

† Medical Logic, Edit. 2, p. 50.

ANTILITHICS AND LITHONTHRYPTICS.

ANTILITHICS* are remedies which have the power of preventing the formation of those mechanical deposites from the urine, which give origin to calculous concretions; and may belong either to the class of Vital, or Chemical Agents.

LITHONTHRYPTICS† are those medicines which, by a chemical operation, are capable of dissolving calculous concretions.

It has been already shown, while treating the subject of Diuretics, that certain substances, when internally administered, are capable of passing the barriers of digestion, and of entering the circulation; and that, moreover, these bodies may be again separated by the secretory vessels of the kidneys, and be ejected from the body in the urine. It cannot therefore be contended, that the urinary calculus is placed beyond the sphere of direct medicinal influence, nor can any argument, founded upon the alleged incompatibility of chemical and vital action, be fairly maintained in this case; for the urinary calculus, as well as the urine itself,‡ may very justly be considered as extraneous to the living body. The existence of such a class of remedies as that of Lithonthryptics being thus established, we have to consider the mode and possible extent of their operation in the different varieties of the disease, which they are thus calculated to palliate or cure. In entering upon this inquiry, it is not my intention to prosecute the subject farther than may be necessary to explain the *modus operandi* of the remedies in question, and in conformity with the object and plan of this work, to establish some general principles that are to direct us in their election, combination, and administration; for farther details the practitioner must consult the systematic treatises of *Prout*[*] and *Marcet*,[†] and the very able papers of Mr. *Brande*,[‡] and Dr. *Wilson Philip*.[||]

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* From *ἀντὶ against*, and λίθος *a stone*.

† From λίθος, and *θρύπτω to break*.

‡ The kidneys have a more obtuse sensibility, and not such energetic activity as other glands possess; vital action is less concerned in the secretion they carry on, and their functions more easily fall under chemical and hydraulic explanations—(*Richerand.*)

The urine may be considered as one of the most heterogeneous of the animal fluids;[§] and since a knowledge of its composition, and that of the morbid changes of which it is susceptible, must constitute the basis of all our knowledge respecting the formation and cure of calculous affections, the following results of an elaborate analysis by *Berzelius*, are submitted with a view to elucidate our pathological researches.

Animal Principles.	Water	933·00
	Urea	30·10
	Lithic Acid	1·0
	Pure Lactic Acid, Lactate of Ammonia, and Animal Matters not separable from these	17·14
	Mucus of the Bladder	·32
Alkaline and Earthy Salts.	Sulphate of Potass	3·71
	——— of Soda	3·16
	Phosphate of Soda	2·94
	——— of Ammonia	1·65
	Muriate of Soda	4·45
	——— of Ammonia	1·50
	Earthy Phosphates with a trace of Fluate of Lime	1·0
	Silex	·03
		1000·00

Besides the above ingredients, which appear to be essential to healthy urine, Dr. Prout observes that in different diseases it may contain Albumen, Fibrin, and the red particles of the blood; Nitric acid; various acids, which are found to be modifications of the Lithic; Oxalic acid; Benzoic acid; Carbonic acid;[¶] Xanthic Oxide; Cystic Oxide; Sugar; Bile; and Pus.

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[*] An Inquiry into the Nature and Treatment of Gravel, Calculus, and other diseases connected with a deranged operation of the Urinary Organs; by W. Prout, M.D. F.R.S.

[†] On the Chemical History, and Medical Treatment of Calculous Disorders, by A. Marcet, M.D. F.R.S.

[‡] Journal of the Royal Institution, Vol. VI.

[||] Medical Tranſactions of the College of Physicians, Vol. VI.

[§] The ancients considered the urine as a kind of extract of animal substances, a true *lixivium*, by which every thing impure in the animal economy was *washed away*, and hence they gave it the name of *Lotium*.

[¶] Mr. Brande first stated the existence of this acid in urine; but Berzelius expressed his doubts respecting the fact. The experiments of Dr. Marcet, however, are certainly favourable to the conclusion of the former chemist, and Dr. Prout informs us that he has himself seen small calculi discharged from the bladder composed principally of the *carbonate of lime*.

It will be necessary in this place to make a few observations upon the nature and habitudes of those principles, which are more immediately active in the production of calculi—

1. *Urea* is a principle peculiar to urine, and must be regarded as a result of the action of the kidneys upon some of the constituents of the blood, perhaps, as Dr. Prout suggests, upon its albuminous matter; for a long time it was regarded as the peculiar principle upon which the colour and other sensible qualities of the urine depended; Berzelius, however, has corrected this fallacy, and considers that the Lactic acid, and its accompanying animal matters, are the bodies which impart to this fluid the characteristic smell and colour which distinguish it.*

2. *Lithic*, or *Uric*† *Acid*. As this principle is not found in the blood, but is constantly present in healthy urine, it follows that it must be generated by the action of the kidneys. M. Majendie has lately endeavoured to prove that its secretion depends upon the *Azote* received in alimentary substances, and for the following reasons, *viz*. 1. Azote is a component part of *Lithic Acid*‡—2. Those persons who use a large proportion of animal food, and fermented liquors, are liable to calculous disorders—3. When animals are confined to food which contains no Azote, no Lithic acid is formed—but of this anon.—Berzelius and other animal chemists have supposed that this acid exists in urine in a free state; but Dr. Prout, whose arguments appear very satisfactory and decisive, is of opinion that it is always in combination with ammonia (*Lithate of Ammonia*) from which however it is very easily separated by the addition of any acid, even the carbonic, in the form of a red pow-

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* The reader will find some interesting observations upon this subject in Dr. Prout's Treatise, page 22.

† The name of *Uric* Acid was suggested by Dr. Pearson; it is, however, as Dr. Marcet very justly remarks, objectionable, on account of the close resemblance which the term bears to that of *Urea*, a substance totally distinct from *Lithic Acid*.

‡ ULTIMATE PRINCIPLES OF LITHIC ACID.

	According to M. Berard, and adopted by M. Majendie.	*According to Dr. Prout.*
Azote	39·16	31·12
Carbon	33·61	40·00
Oxygen	18·89	26·66
Hydrogen	8·34	2·22
	100·00	100·00

der. It moreover appears to be susceptible of several important modifications, with which it behooves the pathologist to be acquainted; the profession is greatly indebted to the ingenuity and industry of Dr. Prout for some very essential additions to our knowledge, respecting the habitudes of *Lithic acid* with different bodies.

Erythric Acid. When nitric acid diluted with about an equal bulk of water, is poured upon pure lithic acid, and a moderate heat is applied, an effervescence takes place, and the lithic acid is dissolved; if we then concentrate this solution by a gentle evaporation, we obtain transparent colourless crystals, which have been found to constitute a peculiar acid, to which M. Brugnatelli has given the name of *Erythric Acid.*

Purpuric Acid. Dr. Prout has discovered that if into a strong solution of the above crystals in water, whilst boiling hot, we carefully drop some pure ammonia, the solution acquires a beautiful purple* colour, and crystals of *purpurate of ammonia* speedily begin to form and subside. If these crystals are treated by means of potass and sulphuric acid, pure *Purpuric acid* is obtained in the form of a yellowish, or cream-coloured powder.

3.—*The Phosphates.* As the Phosphoric acid and its compounds perform an important part in the generation of calculi, their origin† and history demand particular attention from the chemist. The Phosphoric acid frequently exists in the urine in a free state, when it would

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*This fact derives its pathological interest from the probability that, in certain states of disease, the Lithic acid assumes this peculiar modification, giving to the sediments of urine those beautiful hues which were formerly considered by Prout as the effect of an acid, which he named the *Rosacic;* now as the Purpuric acid, or rather the *Purpurate of Ammonia,* says Dr. Prout, is nothing more than Lithic acid modified by the action of Nitric acid, and, as I have already shown that the *Pink* and *Lateritious* sediments occasionally contain nitric acid in some peculiar state of combination, the nature and origin of the colouring matter ceases to be problematical.

†Whence is derived the large quantity of Phosphoric Acid which is daily evacuated from the system?—The researches of modern chemistry have furnished a very satisfactory solution of this problem, by demonstrating its presence in those animal and vegetable substances which are used by us as food. Mr. Barry, in prosecuting his interesting and important experiments on the preparation of Pharmaceutical Extracts *in vacuo,* discovered the curious fact, that *Phosphoric acid* is to be found in all the extracts in a soluble state; and on extending the investigation, says he, it was ascertained that this acid, besides that portion of it which exists as *phosphate of lime,* is contained in a vast variety of vegetables, and more especially in those which are cultivated. *Medico-Chirurg. Trans. Vol.* 10, *p.* 240.

appear to act, like any other acid, as a precipitant of the Lithic acid; this however is not the circumstance that renders its presence formidable; it is to the abundance of its compounds that we are to look for mischief. In healthy urine the phosphoric acid appears to exist in unison with soda and ammonia, and partly with lime and magnesia; the latter salts being retained in solution by an excess of acid; but the proportion of these bodies is liable to considerable variation.*

Having thus briefly noticed those particular points in the chemistry of the subject with which the therapeutic principles are more immediately connected, we shall be better prepared to examine and appreciate the several plans of treatment which have been proposed for the prevention, cure, or palliation of calculous disorders; and here the subject naturally divides itself into two parts; the one comprehending the *modus operandi* of Anti-lithics, or those remedies which prevent or correct the calculous diathesis; the other explaining the solvent action of Lithronthryptics over concretions already formed.

The line of demarcation by which healthy and morbid urine are separated, is so slight that it is difficult to define its limits; nor would the circumstance appear to be materially important, for the boundary is daily exceeded, not only with impunity, but even without our consciousness of the event; and Dr. Prout has accordingly denominated such occasional deviations, the "*Sediments of Health.*"

Dr. Prout considers that mechanical deposites from the urine, although composed of the same general ingredients, may, in a pathological point of view, be conveniently divided into three classes, viz. *Pulverulent* or *Amorphous Sediments*; 2. *Chrystalline Sediments*, usually denominated gravel, and 3. *Solid Concretions* or calculi formed by the aggregation of these latter sediments. The first of these may be passed over, as unconnected with the present subject; the latter however constitutes an essential object of research; for a complete acquaintance with the chemical history of calculi can alone furnish the true indications of cure.

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* The urine of infants and nurses contains very little phosphate of lime and phosphoric acid; it is not until after ossification is finished, that these elements are found in abundance in the urinary fluid. That of old men, on the contrary, contains a great quantity of them; the bony system, already overcharged with phosphate of lime, refuses to admit more of it. This saline substance would ossify every part, as it does sometimes in the arteries, ligaments, cartilages, and membranes, if the urine were not to remove the greater part of this superabundant portion. In *Rachitis* it is by the urine that the phosphate of lime passes off, the absence of which causes the softness of bones. (*Richerand.*) If we might be allowed to theorise, I should say, that this disease depends upon a deficient action in the powers of assimilation, in consequence of which the phosphoric acid is incapable of entering into its assigned combinations, and is therefore eliminated as excrementitious.

Scheele,[*] with whom the inquiry originated, conceived that every calculus consisted of a peculiar concrete acid, soluble in alkaline lixivia, and which Morveau denominated the *Lithic Acid;* but the subsequent researches of Fourcroy, Vauquelin, Wollaston, Pearson, Henry, Brande, Marcet, and Prout, have demonstrated the existence of *several* bodies in the composition of urinary calculi, viz. *Lithic Acid; Phosphate of Lime; Ammoniaco-magnesian Phosphate; Oxalate of Lime; Cystic Oxide;*[†] and *Xanthic Oxide,*[‡] to which may be added an *animal cementing ingredient.* The varieties of calculi produced by the combination or intermixture of these ingredients, are represented in the following Tabular arrangement.

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[*] Transactions of Stockholm.

[†] CYSTIC OXIDE, discovered by Dr. Wollaston in 1815: it does not affect vegetable colours, and has all the chemical habitudes of an oxide.

[‡] Dr. Marcet discovered two calculi, which were not referrible to any of the known species; but they are not introduced into the following table, as they may never again occur; at all events, from their extreme rarity, they cannot be considered as objects of practical interest. To one of these he has given the name of *Xanthic Oxide,* because it forms a lemon-coloured compound when acted upon by Nitric acid. To the other nondescript calculus he has bestowed the appellation of *Fibrinous,* from its resemblance to Fibrine.

A Tabular View of the different Species of Urinary Calculi.

SPECIES OF CALCULI.	EXTERNAL CHARACTERS.	CHEMICAL COMPOSITION.	REMARKS.
1. LITHIC OR URIC.	*Form*, a flattened oval; *Specific gravity*, generally exceeds 1·500; *Colour*, brownish or fawn-like; *surface* smooth; texture laminated.	It consists, principally, of *Lithic acid*; when treated with nitric acid, a beautiful pink substance results. This calculus is slightly soluble in water, abundantly in the pure alkalies.	It is the prevailing species; but the surface sometimes occurs finely tuberculated. It frequently constitutes the *Nuclei* of the other species.
2. MULBERRY.	*Colour*, dark-brown; *texture*, harder than that of the other species; *Sp. grav.* from 1·428 to 1·976. *Surface*, studded with tubercles.	It is *Oxalate of Lime*, & is decomposed in the flame of a spirit lamp, swelling out into a white efflorescence, which is *Quick-lime*.	This species includes some varieties which are remarkably smooth and pale coloured, resembling a *hemp seed*.
3. BONE EARTH.	*Colour*, pale brown or gray; *surface* smooth and polished; *structure*, regularly laminated; the laminæ easily separating into concrete crusts.	Principally *Phosphate of Lime*. It is soluble in muriatic acid.	
4. TRIPLE.	*Colour*, generally brilliant white; *surface* uneven, studded with shining crystals; less compact than the preceding species; between its laminæ, small cells occur, filled with sparkling particles.	It is an *Ammoniaco-magnesian phosphate*, generally mixed with phosphate of lime; pure alkalies decompose it, extricating its ammonia.	This species attains a larger size than any of the others.
5. FUSIBLE.	*Colour*, grayish white.	A compound of the two foregoing species.	It is very fusible, melting into a vitreous globule.
6. CYSTIC.	Very like the Triple Calculus, but it is unstratified and more compact, and homogeneous.	It consists of *Cystic Oxide*; under the blow-pipe it yields a peculiarly fetid odour. It is soluble in acids, and in alkalies, even if they are fully saturated with carbonic acid.	It is a rare species.
7. ALTERNATING.	Its section exhibits different concentric laminæ.	Compound of several species, alternating with each other.	
8. COMPOUND.	No characteristic form.	The ingredients are separable only by chemical analysis.	

Let us now inquire into the circumstances under which the several substances enumerated in the foregoing table are found to be deposited; and first of the *Lithic acid Diathesis.* It has been already stated, that the lithic acid exists in the urine in combination with ammonia, so as to be held in solution under ordinary circumstances; if however any free acid be generated, the lithic acid is immediately precipitated, giving rise to the appearance so well known under the name of *red gravel;* from this view of the subject the lithic acid deposite must be considered as arising, not from the excess of that substance in the urine, but from a decomposition of the compounds into which it enters by the agency of a free acid. M. Majendie is therefore incorrect in attributing its appearance to the quantity of azote in the ingesta; an opinion which has been very ably controverted by Dr. Philip in a paper published in the sixth volume of the Medical Transactions. It appears, moreover, that whatever tends to disturb the process of digestion, by favouring the production of acid, may be considered as the exciting cause of the lithic deposites; especially where the cutaneous functions are imperfectly performed; for Dr. Philip is of opinion, that the precipitating acid, in a healthy state of the system, is thrown off by the skin; and he supposes that even when generated in excess, it may be diverted to the surface of the body by merely increasing the insensible perspiration. The medical treatment of the lithic diathesis is thus rendered simple and satisfactory; and if the opinion of Dr. Prout be true, that at least two-thirds of the whole number of calculi originate from lithic acid, the extreme importance of the subject is too apparent to require comment. Remedies, medicinal and dietetic, that are capable of correcting dyspeptic symptoms, such as slight bitters,* will doubtless prove valuable resources; while all those agents which have a tendency to correct and regulate the insensible perspiration, will necessarily fall under the head of antilithic remedies. Mr. Copland Hutchinson, in a paper which has been published in the Transactions of the Medico-Chirurgical Society, has shown the comparative rarity of calculous disorders in British seamen. Can the quantity of muriate of soda taken with their food, from its stimulating influence upon the cutaneous functions, be considered as affording a plausible explanation of this fact? The *Phosphatic Diathesis* seems to be accompanied with considerable derangement of the chylo-poietic viscera, and Dr. Prout very justly remarks, what I have frequently observed, that the stools are extremely unnatural; as the phosphates are retained in solution by an excess of acid, it would appear as if an alkaline principle was occasionally developed, and it is not unreasonable to suppose that this may be sometimes derived from bilious regurgitations; in some cases, the alkali is derived from the spontaneous decomposition of urine itself, especially where the bladder has lost its *governing power*,* as from some injury† of the spine; or from some local affection of the bladder or prostate gland; wherever the urine undergoes an incipient process of decomposition, ammonia will be generated, and an *ammoniaco-magnesian phosphate*‡ be immediately precipitated: hence in cases where the bladder is unable to discharge its contents, this deposite is very apt to take place, as in diseases in the prostate; and this explains the reason why the triple phosphates are so frequently formed in elderly people, who cannot wholly evacuate their urine.

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* I am by no means disposed to reject as a popular fallacy, the general opinion in favour of the anti-lithic virtues of malt liquor; the observations which have been already offered (*page* 107) will explain how such agents may occasionally operate in assisting digestion. In the observations made upon the Bills of Mortality in the year 1662, by an ingenious citizen, concerning the increase of some diseases, and the decrease of others, it is observed "The Stone and Strangury decreaseth, from the drinking of Ale."

It will appear evident from these cursory observations, that some varieties of Calculi will be influenced by acids, and others by alkalies, and that the exhibition of such remedies will be liable to palliate, or to aggravate the symptoms, according to the character and composition of the offending calculus, and according to the prevailing diathesis of the patient; as a general rule to direct us in the chemico-medical treatment of these cases, Dr. Marcet states, that "*Whenever the lithic acid predominates, the alkalies are the appropriate remedies, but that when the calcareous or magnesian salts prevail, the acids are to be resorted to.*" But if it be asked how we are to discover the nature of the calculous affection, so as to direct the suitable remedy? the reply is obvious—by an examination of the sediment deposited by the recent urine, or by an analysis of the small fragments which are frequently voided with it; the Phosphates subside from the urine as a *white*, lithic acid, as a *red* deposite; and since the phosphates are held in solution in the urine by an excess of acid, it is evident that whenever such acidity is diminished by the hand of Nature or art, a white sabulous deposite will ensue; hence, says Mr. Brande, it occurs in the urine of persons who drink soda water, or take magnesia; the remedy for such a deposite, when it takes place habitually, is a course of acidulous medicines; on the contrary, since *lithic acid* is precipitated by the acids, alkalies are naturally suggested for the prevention of that deposite. In the *compound* calculi, acids and alkalies may be equally injurious or beneficial, for since these bodies are composed of a variety of ingredients, the action of any one solvent must be partial, and may convert the smooth calculus into a rough and highly irritating body, or vice versa. In the *alternating* calculi it may be judicious to exhibit these remedies alternately, as the symptoms of the case and the deposite of the urine may indicate. After all, however, the solvent powers of Lithonthryptic remedies must be very limited, and in advanced cases we can never expect to procure more than palliation. With respect to the agency of these different remedies, as *Anti-lithics*, I would observe, that while experience bears us out in confiding in the production of certain chemical effects from their use, we must not forget that much is to be effected by their judicious administration as vital agents: and it will be hereafter my duty to point out the many advantages that may be obtained, by combining in one formula medicines which individually belong to each class.

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* See an explanation of this term in the note, at page 108.

† It is, says Dr. Prout, a very old observation, that injuries of the back produce *alkaline urine*; "it also appears," continues this author, "to hold in other animals as well as in man, thus I have frequently observed jaded and worn-out horses pass great quantities of lime in their urine; I have known the same also to take place in dogs, and particularly of the sporting kinds; and in both these instances have thought it probable, that the circumstance was connected with some strain or injury of the back produced by over-exertion, or other causes."

‡ I have in my possession a splendid specimen of this triple salt, in large and well-defined crystals, covering a portion of a decayed beam; it was sent to me by my friend Mr. Marshall, from whom I learnt that it had been taken from a privy belonging to a public-house in Southwark. I lent the specimen to the late Mr. Wilson, in order that he might exhibit it in his lectures before the College of Surgeons, and he has published a description of it in his work on the Urinary and Genital Organs.

Independent of any chemical effect, alkaline substances are found by daily experience to allay the morbid irritability of the urinary organs in a manner not yet explained; alkalies may also prove *generally* serviceable in these disorders, by acting immediately upon the digestive organs, for the disposition of forming calculi is always, more or less, accompanied with the indications of deranged digestion; and it is probable that the first link of the series of actions which cause this disposition has its origin in the stomach.

The alkaline carbonates are found to answer as effectually as the pure alkalies, and they have the advantage of being less liable to disagree with the stomach. Mr. Hatchett has proposed the carbonate of magnesia, in doses of ℈j to ʒj, as a valuable substitute for alkaline remedies in cases of lithic calculi; but as its insolubility must render its absorption equivocal, the beneficial operation of the substance must principally depend upon its neutralizing any excess of acid in the primæ viæ, and in this way there can be no doubt of its lithonthryptic agency; "But," says Dr. Marcet, "such is the tendency which the public has to overrate the utility of a new practice, or to take a mistaken view of its proper application, that there is every reason to believe that the use of magnesia has of late years become a frequent source of evil in calculous complaints." Lime water has been also recommended for the purpose of fulfilling the same indications, and as not being liable to produce that irritability of stomach which frequently attends the long-continued use of the fixed alkalies; besides which, some chemists have maintained that it exerts a peculiar solvent power over the cementing animal matter of the concretion, and thereby destroys its cohesion. (*a*)

Where an acid is indicated, the *Muriatic* will in my judgment be found as convenient and effectual as any that can be administered. Mr. Brande proposes *Cream of Tartar* for this purpose; upon this point I differ with him, for this salt, to say the least, is questionable in its mode of operation; for although its first impression upon the stomach is that of an acid, the subsequent processes of digestion decompose it, and eliminate its base, which being absorbed acts upon the urinary organs as an alkali. I have seen a white sabulous deposite, consisting of the Phosphates, in the urine of persons after the constant use of *Imperial* as a beverage, which I am at a loss to explain upon any other principle. Sir Gilbert Blane has also very satisfactorily shown, that a fixed alkali produces the same effect upon the urinary organs, whether it be exhibited alone, or in combination with citric acid; in this latter case the salt undoubtedly undergoes a decomposition *in transitu*, as I have more fully explained under the consideration of diuretics, (*page* 125.) During an alterative course of Lithonthryptic remedies, it may be beneficial to interpose occasionally a purgative medicine, but we must not combine it with the lithonthryptic, at least, if we wish this latter medicine to reach the urinary passages; for it is a law which I have already attempted to establish, (*see page* 125) that *Catharsis suspends the process of alimentary absorption.*

(*a*) For an account of the celebrated remedy of Mrs. Stephens, see *Liquor Calcis.*

ANTIDOTES.

Synon: *Alexipharmics. Alexiterials. Counter-poisons.*

Medicines which are capable of preventing the ill effects of a poison; or, of counteracting its fatal virulence.

There is perhaps no subject upon which the credulity of mankind has been so extravagantly exercised as on that of Poisons; nor is there, certainly, any class of remedies whose history has suffered so many vicissitudes from the caprice of hypothesis, as that of Antidotes.[*]

It is not my intention, on the present occasion, to enumerate the many extraordinary virtues[†] which credulity has, at different times, assigned to such medicines; nor shall I consume the time of the reader by attempting to expose the absurdity of those fearful powers with which ignorance, terror, and imposture, have invested certain poisons,—a subtilty so extreme as to defeat the most skilful caution, and a virulence so manageable as to be capable of the most accurate graduation; so that while the former attribute was believed to ensure their deadly operation, although exerted through the most secret and least suspicious medium, as that of gloves,[‡] tapers, or letters, the latter was said to enable the accomplished assassin to measure the allotted moments of his victim with the nicest precision, and to occasion his death at any period that might have been previously determined.[‖]

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[*] The word *Antidote* is derived from *ἀντὶ, against*, and *δίδωμι, I give;* as being a medicine given *against* poison, either by way of cure or preservative. The word is also sometimes used in a more general sense, for any compounded medicine; thus *Peter Damian* speaks of a person who in his whole life never took an antidote. It is likewise used by some authors in a less proper sense, for any remedy against any disease, chiefly if it be inveterate, and arise from some ulcer or abscess; and lastly, the term has been used to signify a perpetual form of medicines, otherwise called *Opiates*, or more properly *Confections*.

[†] See the history of *Theriaca* at page 47, note.

[‡] John, king of Castile, as *Tissot* relates, was poisoned by a pair of boots, prepared by a Turk; Henry IV, by gloves; Louis XIV, fearing a project to poison Philip V, prohibited his opening letters, or putting on gloves (*Tissot Traité des Nerfs. T.* 1, *P.* 11, *pag.* 13. *Plouquet* has the following remark upon this subject, "*Huc et ignota illa venena pertinent, quibus epistolæ chirothecæ, et ejusmodi infici, et vim adeo toxicam induere dicuntur, ut lectio ejusmodi epistolæ, indutus chirothecæ subitam mortem causentur.*" (*Comment Med. super Homicid. p.* 184.) Pope Clement VII is said by *Zacchias* to have been poisoned by the fumes of a taper; (*Quæst. Med. Leg.*) and a priest is reported to have offered to destroy Queen Elizabeth by poisoning her saddle. (*Sir Edward Coke, in the trial of Sir John Hollis.*) For a detailed history of occult poisoning, the reader may refer to our work on "*Medical Jurisprudence.*"

[‖] This conceit does not appear to have been confined to the ignorant, The abandonment of such notions may be considered as one among the many advantages which have arisen to medicine, from the cultivation of physiology.

Without farther introduction, I shall proceed to the main object of this work, and inquire how far a chemical agent may be capable of neutralizing, or of decomposing, a poisonous substance in the human body; and to ascertain the degree of confidence to which it may in each particular case be entitled; equally important is it to learn, whether certain vital agents may not be serviceable in cases of poisoning, either by promoting the elimination of the poison, or by producing a state of the system best calculated to resist its deleterious operation.

It may be safely asserted that we possess very few true antidotes; for although several of the mineral poisons may be neutralised or decomposed by various re agents, yet their destructive action is generally so rapid, that the mischief is effected before any chemical changes can avail; and in other cases, the substances resulting from the chemical action, are as poisonous as the original ingredients; while, under certain circumstances, I suspect that the vital powers of the stomach are in direct opposition to those changes and decompositions which so readily, and so uniformly, take place in our laboratories. To *vital agents* then, the practitioner must principally look for succour; but before we can establish any general rules for the treatment of poisoning, it is essential to distinguish between the different modes in which poisonous substances produce their effects, or at least to determine the parts of the living system through which they act; for it will be found, that each poison has its own *modus operandi*, and that from this are to be derived the particular indications of cure.

The hypothesis devised by the ancient physicians, to account for the destructive powers of these substances, were principally derived from mechanical notions respecting the supposed form of their particles, which they imagined capable of lacerating and disuniting the animal fibres by the sharpness of their spiculæ;* it is, however, now satisfactorily established

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alone, for we learn from *Spratt's* History of the Royal Society, that very shortly after the institution of that learned body, a series of questions was drawn up by their direction, for the purpose of being submitted to the Chinese and Indians, which clearly shows their belief in the possibility of such an operation, viz. "Whether the Indians can so prepare that stupifying herb, Datura, that they make it lie several days, months, years, according as they will have it, in a man's body, without doing him any hurt, and at the end kill him without missing half an hour's time?"

* Dr. Mead adopted this opinion, but he became so convinced of its inadequacy that, in the later editions of his work on Poisons, he withdrew the

that the action of a poison upon the human stomach is very rarely, if ever *mechanical;* sometimes *chemical;* but for the most part *vital* in its operation.

Each of the three kingdoms of nature furnishes a number of poisons, the investigation of whose chemical properties and physiological action, and of the symptoms to which their administration gives rise, the lesions of structure which they occasion, and the medical treatment which they require, constitutes an elaborate branch of science designated by the term TOXICOLOGY.

Poisons differ materially from each other, not only with respect to the modes in which they produce their effects in relation to the several vital organs, but with respect to their application; some of those, for instance, which are speedily fatal, if introduced into a wound, may be taken into the stomach with complete impunity, as in the instance of the venom of the viper and other snakes, which appears to exert no influence on the stomach; others, on the contrary, display their deleterious action on the stomach alone, such as caustic acids and alkalies, corrosive sublimate, and some chemical poisons; while others, again, are equally destructive whether applied to the inner surface of the stomach, or to the lower intestines, in the form of clyster, or even to the mucous membrane of the mouth or nose; to the eye; to the vagina and orifice of the uterus, or to an abraded portion of the skin. There is moreover a class of substances which may be termed *aërial* poisons, for they may exist in a state of gas, or be held dissolved in the atmosphere, and be received by respiration, or by the mucous membranes of the nose and throat; the saliva may also thus become the medium for transferring various subtile poisons from the atmosphere to the animal body; this is well illustrated by the fact of the transfer of metallic influence, as related in the case of a gentleman in perfect health who became salivated in consequence of sitting for one hour by the side of a person who was in a state of mercurial ptyalism, in order to give him a lesson in botany.

It also deserves notice, that a poison acts with different degrees of force and celerity in different parts of the same tissue; its absorption, for instance, would appear to be energetic in proportion to the number of veins, although several

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hypothesis. It is hardly necessary to observe, that upon its abandonment, a host of supposed antidotes at once fell into disuse; for as long as the injury was supposed to arise from mechanical irritation, oils, fats, and other similar remedies were held capable of obtunding the acrimony.

apparent exceptions to this law might be adduced,* and it is evident that the plethoric state of the part with respect to its blood-vessels has a considerable share in modifying the effects; this observation, however, has no relation to those poisons which operate on the system through the sympathetic communication of the nerves; Mr. Brodie, for instance, found that the poison of bitter almonds acted more speedily when applied to the tongue, than when injected into the intestines, though the latter presents a much better absorbing surface.

Foderé, in the fourth volume of his *Medicine Legale*, arranges poisons according to their action on the living system, and which, with a slight alteration in the order of the classes, has been adopted by *Orfila*, and most other writers on Toxicology. Poisons are thus reduced into six classes: viz. 1. Corrosive or Escharotic, as the *Preparations of Mercury*, *Arsenic*, *Antimony*, *Copper*, *Tin*, *Zinc*, *Silver*, *Gold*, and *Bismuth*; the *concentrated Acids*, and *caustic Alkalies*, and *Earths*; *Cantharides*; *glass and enamel powder*. 2. Astringent Poisons, of which the *preparations of Lead* constitute the only species. 3. Acid or Rubefacient Poisons, which, with a few exceptions are furnished by the vegetable kingdom, as certain *drastic purgatives*, *Hellebore*, *Euphorbium*, &c. 4. Narcotic Poisons, *Opium*, *Henbane*, the *Cherry-laurel*, *Stramonium*, &c. 5. Narcotico-Acrid, embracing such articles as produce the united effects of the two former, and which constitute some of the most deadly poisons, as the *Ticunas*, *Nux-vomica*, *Belladonna*, *Tobacco*, *Hemlock*, *Digitalis*, &c. 6. SEPTIC POISONS, *contagious miasmata*, *putrid exhalations from animal matter*, *Sulphuretted Hydrogen*, *the venom of the viper*, &c. If we are to found our classification upon views strictly pathological, the above arrangement is perhaps as eligible as any that could be proposed, and it has certainly the obvious advantage of bringing together those individual substances which occasion effects somewhat analogous, upon the living animal system; and yet such a plan will not enlighten our therapeutical doctrines; *arsenic* and *corrosive sublimate* are, for instance, both corrosive poisons, but they differ from each other materially in their physiological action; and when swallowed, require for the preservation of the individual, a very different system of treatment. It is from the views of their physiological and chemical action that our curative indications are to be chiefly derived; and the able and interesting researches of *Mr. Brodie*[*] enable us, in a very satisfactory manner, to construct an arrangement by which the treatment of poisons may be at once rendered more efficacious and simple: thus poisons may be said to act

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* The introduction of poisons into the body through the medium of the circulation of the blood is frequently alluded to by the physiologists of the seventeenth century. I have lately met with a curious passage in a work entitled "Popular Errours in Physic, first written in Latine by the learned physitian, James Penrose, Doctor in Physick. London, 1651." "The venome is carried by the veines and arteries, as appeares in that all the blood of them that have been bitten by a viper doth turne into a pale greennesse. And seeing that the veines in the papps are so very slender, and doe not come unto the heart, but with a great many long windings, I affirme, and it is more probable, that if the viper be applyed to the feet, which are farthest remote from the heart, it will sooner infect the heart than if to the papps, but soonest of all if it be applyed to the armes. And now the story of Cleopatra comes to my minde. Petrus Victorius blames the painters, that paint Cleopatra applying the aspe to her papps, seeing it is manifest out of Plutarch in the life of Antonius, and out of Plinie likewise, that she applyed it to her arme. Zonaras relates that there appeared no signe of death upon her, save two blew spots on her arme. Cæsar also in her statue which he carryed in triumph, applyed the aspe to her arme; for in the armes there are great veines and arteries, which doe quickly, and in a straight way convey the venome to the heart, whereas in the papps the vessels are slender. And therefore in Saint Paul the miracle was so much the greater, in that he felt no harme from the viper, which layd hold on his hand, for if it had assailed him on the breast, he had had respite enough to take some antidote."

I. THROUGH THE MEDIUM OF THE NERVES WITHOUT BEING ABSORBED.

a. By destroying the functions of the brain.

Alcohol.
Ess. Oil of Almonds.
Juice of Aconite.
Oil of Tobacco.
Opium?

b. By rendering the heart insensible to the stimulus of its blood.

Infusion of Tobacco.

II. BY ENTERING THE CIRCULATION, AND ACTING THROUGH THAT MEDIUM WITH DIFFERENT DEGREES OF FORCE, ON THE HEART, BRAIN, AND ALIMENTARY CANAL.

Arsenic.
Emetic Tartar.
Muriate of Baryta.

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[*] See *Experiments and Observations on the different modes in which Death is produced by certain vegetable Poisons, by* B. C. BRODIE, F.R.S. in the 101st vol. of Phil. Trans. for the year 1811.

The Woorara, and all poisons which act by external application, as the venom of the viper, &c.

III. BY A LOCAL ACTION ON THE MUCOUS MEMBRANE OF THE STOMACH.

Corrosive Sublimate of Mercury.
Acids and Alkalies.
Mechanical Irritants; as diamond dust? powdered glass?*

It had been long admitted that a poison may produce death, by acting on the extremities of the nerves of the stomach and intestines, without being absorbed; but to the experimental labours of Mr. Brodie we are indebted for our present correct views upon the subject. It was observed by *Bichât*, (and the observation has been confirmed by *Brodie*) that the influence of the brain is not *directly* necessary to the action of the heart; for that when the functions of the brain are destroyed, even when the head is removed, the heart continues to contract for some time afterward, and then ceases only in consequence of the suspension of respiration, which is under the direct influence of the brain; assuming this as a principle, it will easily appear that certain poisons may, by affecting the brain, paralyze the muscles of respiration, and occasion death by suffocation. Mr. Brodie accordingly found, that by the administration of a large dose of alcohol to a rabbit, the pupil of its eyes became dilated, the extremities convulsed, and the respiration laborious, and that this latter function was gradually performed at longer and longer intervals, and that it at length entirely ceased. Two minutes after the apparent death of the animal, he opened the thorax, and found the heart acting with moderate force and frequency, *circulating dark-coloured blood;* he then introduced a tube into the trachea, and produced artificial respiration by inflating the lungs, and found, that by these means the action of the heart might be kept up to the natural standard, as in an animal from whom the head is removed. The same phenomena resulted from the injection of two drops of the *essential oil of bitter almonds*, diffused in half an ounce of water, into the rectum of a cat; and from the application of the empyreumatic oil of *tobacco* to the tongue, and rectum of cats and dogs. Now it is obvious that the functions of the brain are immediately disordered by the influence of these poisons on the tongue, stomach, and lower bowels of animals so instantaneously, that it is impossible that absorption should have already taken place. The poisons above enumerated appear to affect the brain only, and through it the organs of respiration, leaving the powers of the circulation unimpaired; there are, on the contrary, certain substances which act on the heart at once, such is the *Infusion of Tobacco*,* which suspends its action even before the animal ceases to respire, and kills by producing Syncope. The same effects are occasioned by the two species of *Upas* from Java, called *Upas Antiar*, and *Upas Tieuté*.† In these cases, it is probable that the spinal marrow is primarily affected, which recent experiments have shown to have an intimate relation with the action of the heart. We come next to speak of those poisons which enter the circulation, and act through that medium on the heart, brain, and alimentary canal. These organs, however, are affected in very different degrees by different poisons. Mr. Brodie has shown that vegetable poisons, although when introduced into the alimentary canal affect life, in consequence of the nervous sympathy which subsists between these surfaces and the common sensorium, yet, that the same poisons applied externally to a wound, produce their effects exclusively through the medium of the circulation, being conveyed to the brain only by mixing with the blood in the vessels, and not by being conveyed through the absorbents; for a ligature upon the great vessels prevents them from producing their deleterious effects; whereas a ligature upon the thoracic duct, or general canal through which all the absorbents pour their contents into the blood, does not in the least retard or prevent the operation of the poison. There are also several of the mineral poisons, which, whether introduced into the stomach, or applied externally to a wound, poison the animal, in consequence of being carried into the circulation. It had long been supposed that *Arsenic* occasioned death by inflaming the stomach; but Mr. Brodie has clearly demonstrated that its influence arises from its being absorbed, and that it must be regarded as a vital rather than as a chemical agent; in the first place, he has found the inflammation of the stomach, in several cases, so slight, that on a superficial examination it might have been easily overlooked; and in most of his experiments with arsenic, death took place in too short a time to be considered as the result of inflammation; and in the next place, in whatever manner the poison is applied, whether *externally* to a wound, or *internally* to the membrane of the stomach, the inflammation is confined to the stomach and intestines; and indeed, it is commonly more violent, and even more immediate, when applied to a wound, than when internally administered; and it also precedes any inflammation of the wound; this important fact was proved by an experiment made by Mr. Hunter and Sir Everard Home, and subsequently by the repeated investigations of Mr. Brodie. It deserves notice, however, that although the affection of the stomach and intestines from this poison is not, under ordinary circumstances, the cause of death, it *may* be so in some instances, where the animal survives the effects produced on the organs which are more immediately subservient to life. Mr. Henry Earle communicated to Mr. Brodie an interesting case of this description of a woman in St. Bartholomew's hospital, who had recovered from the immediate symptoms occasioned by the ingestion of arsenic, but died at the end of four or five days; when, upon dissection, there appeared extensive ulcerations of the stomach and bowels.

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* There can be no doubt, but that death has been produced by the mechanical operation of various insoluble bodies; although we cannot believe the numerous tales recorded on the subject of diamond dust (supposed to constitute the basis of the celebrated "*Powder of Succession*") or of powdered glass, &c. Numerous cases are recorded where life has been destroyed by the lodgment of substances in the intestines; and we have lately heard of the fatal effects produced by alvine accumulations from the habitual use of Magnesia. With respect to the danger from the ingestion of glass and enamel in powder, there still exists much difference of opinion; *Caldani, Mandrussato*, and *M. Le Sauvage*, report experiments made upon men and animals, in which no bad consequences followed; on the other hand, *Schurigius* (*Chylologia*) and *Cardanus* (*De Venenis*) cite instances where persons have died of ulcerations of the stomach from such causes; and *M. Portal, Foderé*, (*Medicine Legale*) *Plouquet* (*Comment. super Homicid.*) *Stoll*, (*Ratio Medendi*, part vi. p. 60) *Gmelin* (*Hist. General. de Ven. mineral.*) *Frank* (*Man. de Toxicol.*) furnish testimony in support of the opinion which assigns to such bodies a highly deleterious action.

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* It is a very curious circumstance, that the Oil of Tobacco should differ so essentially in its physiological action from the Infusion of that vegetable poison; the former we have stated, affects the brain only, the latter we now learn, when taken into the alimentary canal, suspends the action of the heart. This apparent anomaly at first led Mr. Brodie, as he has since informed me, to suspect the accuracy of his experiments: and I suggested to him, whether a probable explanation might not be derived from the late chemical researches into the composition of tobacco, which have shown the existence of two active principles, viz. *Nicotin*, and an *Essential Oil?* Where an infusion is employed, we seem to obtain the influence of the former, and the effects are displayed upon the heart; but where the oil is applied, the *Nicotin* has been removed, and the brain is the organ principally affected—see *Tabaci Folia*.

† The *Upas Tieuté* of Java is obtained from a species of *Strychnus*.

Baryta, and still more actively its *muriate*, produce similarly deleterious effects, whether *internally* or *externally* applied; and like *arsenic* it affects life by rendering the heart insensible to its blood. The same observations will apply to the operation of *Tartarized Antimony*.

Corrosive Sublimate of Mercury, and some other poisons, produce their destructive effects, *not* by impression on the nervous system, nor by entering the circulation, but by inducing local injury on the mucous membrane of the stomach.

Having thus offered a summary of our present views respecting the physiological action of poisons, we are prepared to lay down a general plan of treatment, which, it will be seen, can only be successful when conducted on principles strictly conformable with the just notions which the preceding experiments have so satisfactorily established.

Where a poisonous substance has, either through accident or design, found its way into the alimentary canal, three important indications are if possible to be fulfilled: and under these heads I shall offer such observations as may serve to instruct the practitioner in the philosophy of the general treatment, reserving the details to be observed in that of each poison, for more particular notice in the second part of the work, where the history of these substances will be individually considered. The indications to which I allude are the following, viz.

1. *The immediate ejectment of the poison from the body, by the operation of vomiting and purging.*

Whatever may be the nature of the poison, we should endeavour with all possible expedition, to eject it from the body; and upon the promptness with which this is effected the safety of the patient will generally depend; for the dangerous effects of such substances advance in a very increasing ratio, with the time they remain in contact with a living surface; a question may arise, whether in some cases it would not be judicious to attempt in the first instance the neutralization or decomposition of the poison; where a mineral acid, or a caustic alkali has been swallowed, it would undoubtedly be right to neutralize, and dilute it as soon as possible, and then to excite vomiting, which may be advantageously effected by thrusting the finger down the throat, or by tickling the internal fauces with a feather: where an emetic is at hand, whatever may be its nature, it should be promptly given, but if circumstances will allow us the opportunity of selection, *Antimonials*, *Ipecacuanha*, &c. should be rejected, and *Sulphate of Zinc*, or *Sulphate of Copper*, for several reasons, be preferred; in the first place they do not require much dilution* for their action, a circumstance of no small importance in the treatment of poisons that act by being absorbed; in the next place they are extremely expeditious, a dose of fifteen or twenty grains producing almost instantaneous vomiting, without exciting that previous stage of nausea which so frequently characterizes other emetics, and which occasions a state of the vascular system highly favourable to the function of absorption, (as I have so fully explained at page 116.) After all has been ejected, which the operation of vomiting can effect, we are to proceed to the fulfilment of the second indication, viz.

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* *Dry Vomit of Marriott*. This once celebrated vomit, called *Dry*, from its being exhibited without drink, consisted of equal proportions of *Tartarised Antimony* and *Sulphate of Copper*.

2. *The Decomposition of the remaining Portion, and the adoption of measures best calculated to obviate its absorption.*

Where the substance is in a solid form, and acts by absorption, we should be very cautious how we favour its solution; while, if it exists in a liquid state, our object must be to render its active portion insoluble; this problem involves a series of questions which are wholly *chemical.* In order to prevent, or retard the absorption of the active matter, we must, to a great degree, depend upon the agency of *vital* adjuvants; this latter indication however does not apply to *Corrosive Sublimate* and other substances which act upon the stomach locally, and are not absorbed; copious dilution also, in such cases, will frequently disarm the poison of its virulence,[*] but it should be followed as quickly as possible by vomiting. In cases where the poison requires to be absorbed, before it can display its energies, it would be generally unsafe to administer any solvent. *Alkaline* solutions and *Magnesia*, in cases of the ingestion of arsenic, accelerate its fatal effects, by promoting its solution[†] whereas *Lime*, or its *Carbonate*, has an opposite tendency,[‡] in consequence of the insolubility of *Arsenite of Lime;* so again,

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[*] Sydenham relates a case of poisoning by *Corrosive Sublimate;* which was successfully treated by copious draughts of water, and repeated vomiting (*Opera Medica. Epist.* 1, *p.* 200,) and Orfila, in his laborious work on poisons, presents us with a mass of satisfactory evidence upon the subject.

[†] Circumstances, however, may occur, which will render it even judicious, with certain precautions, to administer a solvent, *in order to remove the particles of the substance*, which sometimes adhere with such obstinacy to the coats of the stomach as to defy the exertions of an emetic to detach them, especially if the poison be arsenic; but let the practitioner remember that this practice can never be allowed until all that can be ejected by vomiting or purging has been previously removed; then perhaps the ingestion of *Magnesia*, or an *Alkaline Salt*, as proposed by Mr. Marshall, might be admissible, but it should be quickly followed up by fresh emetics and purgatives.

[‡] London Medical Repository, August, 1817.

Orfila has shown that the pernicious qualities of the *Muriate of Baryta* are counteracted by the administration of any soluble *Sulphate*, which renders the former substance *insoluble.* In cases where *Verdigris* has been swallowed, the administration of vinegar greatly increases its virulence, as M. Drouard has ascertained, by converting the substance into a soluble *acetate of Copper*. This view of the subject will explain why the pure earth of *Baryta* is so slow, and comparatively inert, in its effects upon the system, while its *muriate* is distinguished by the extreme rapidity and virulence with which it operates. The propriety of administering *vinegar*, *lemonade*, and different acid potations, in order to counteract the baneful effects of *Opium*, which has been so often questioned, will thus also receive ample explanation; it must appear that if any quantity of the substance of opium remain in the primæ viæ, acid, or mucilaginous drinks will, by favouring its solution and absorption, accelerate its fatal effects;* but should it have been previously ejected from the stomach, that then the anti-narcotic influence of a vegetable acid† may remove the consecutive stupor and delirium, and thus realize the expectations which Virgil has so poetically raised.

"Media fert tristes succos tardumque saporem
Felicis Mali: quo non præsentius ullum
(Pocula si quando sævæ infecere novercæ
Miscueruntque herbas, et non innoxia verba)
Auxilium venit, ac membris agit atra venena."

"Nor be the Citron, Media's boast unsung,
Though harsh the juice, and ling'ring on the tongue.
When the drug'd bowl mid witching curses brew'd,
Wastes the pale youth by step-dame hate pursu'd,
Its powerful aid unbinds the mutter'd spell
And frees the victim from the draught of hell."

Chardin, in his Travels through Persia, informs us that when a Persian finds himself in a distressed situation, he has recourse to a piece of opium as large as the thumb, and that immediately afterward he drinks a glassfull of vinegar; by which he is thrown into a fit of laughter, terminating in convulsions and death.

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* The truth of this statement has been very satisfactorily established by the experiments of Orfila (*Toxicologie générale considerée sous les Rapports de la Physiologie, de la Pathologie, et de la Medecine légale*) as well as by several that have been performed in this country.

Tortosa (*Istituzioni di Med. For.*) has remarked that Opium may act mortally without losing much of its weight in the stomach—I should question the truth of this assertion.

† Vegetable acids are in Nature rarely the vehicles of poisons, the most deleterious plants being inert in those parts that are impregnated with acid; the pulp of the fruit of the *Strychnus*, among many others, offers an illustration of this fact. *Virey.*

With regard to the use of *Antidotes*, it has been already stated how little they are to be depended upon; in certain cases, however, we are bound to acknowledge their power, but they should be very rarely trusted, unless subsequent to, or in conjunction with, the operation of an emetic; in many cases the effects of this latter remedy may be promoted by the ingestion of liquids holding the particular antidote in solution, a practice which offers the double advantage of accelerating the elimination of the poison, and at the same time of decomposing any which may remain. Orfila has fully established the fact of *Albumen* being a counterpoison to *Corrosive Sublimate;* vomiting may therefore be very judiciously promoted in cases of such poisoning by water holding the white of egg in solution; with equal effect, where *Verdigris* has been swallowed, sugared water may be used as a diluent to encourage emesis; and *Muriate of Soda* in solution will be found the most efficient antidote to *Nitrate of Silver;* and *Sulphate of Magnesia* to *Acetate of Lead.* Where an emetic salt, like *Tartarized Antimony*, has been taken, copious dilution with common water will in general so provoke vomiting, as to render it its own antidote; but it may be useful to remember, that the *Infusion of Galls*, and according to Berthollet, the *Decoction of Bark*, at the temperature of from 30° to 40° *Fah.* have the power of decomposing it; while Orfila considers milk the most efficient counter-poison to the *Sulphate of Zinc.*

Having ejected from the stomach all the poisonous matter we can by vomiting, and attempted to decompose what remains, we are to pursue such measures as may be calculated to prevent the absorption of the poison into the circulation; it has been already observed that on this account nauseating emetics should be avoided; the reader is now requested to refer to our *exposé* of the celebrated doctrine of *Majendie*, (*page* 116 *note*) and he will see that *Venesection* proves one of the most powerful means of exciting the function of Absorption; hence in poisoning by arsenic, such an expedient should never be recommended,* while a particle of that substance remains in the body; where *Corrosive Sublimate* has been swallowed, the same precaution is unnecessary. The last indication which remains to be fulfilled is—

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* Notwithstanding this fact, we find *Venesection* recommended in works on Toxicology, as a safe precaution to be used against the inflammatory action produced by arsenic.

The application of a ligature above an abraded surface to which a poison has been applied, prevents its effects upon the constitution, not so much by obliterating the capacity of the vessels, as by inducing a local plethora, and so suspending the process of absorption.

3. *To anticipate the occurrence of the Consecutive Phenomena, and to combat them by an appropriate treatment.*

This is to be conducted on the general principles of Therapeutics; the treatment must necessarily vary in each particular case. Where the exhaustion of nervous energy is to be feared, as after poisoning by *Prussic Acid*, ammonia, and other diffusible stimulants will furnish the best resource; where, on the other hand, inflammatory action is to be anticipated, it is unnecessary to detail the plan of treatment which may be adopted with the greatest chance of success. In cases where the nervous system is stupified, the symptoms may be combated by vegetable acids, infusion of coffee, &c. but where it is in a state of preternatural excitement, recourse must be had to opiates.

ESCHAROTICS.

Substances, whose application to the animal solids erodes, or decomposes them.

The operation of these bodies may, in general, be considered chemical; for having destroyed the life of the part to which they are applied, they cause, as if by a species of resulting affinity, the elements of the animal matter to enter into a new state of combination; this is well exemplified in the action of caustic potass, where the nascent elements thus disengaged by the decomposition of the animal substance, reunite in proportions to generate an oily matter, which may be observed to form a film over the ulcerated surface, while the excess of nitrogen and hydrogen constitute ammonia, which is disengaged during the action of the caustic; and may be rendered sensible by inverting over the surface, a small jar moistened with muriatic acid, when fumes of *Muriate of Ammonia* become visible.

Their surgical value consists in their power to remove excrescencies, to establish an ulcer, or to convert an ulcerated surface into a simple sore.

circumstances, aggravated the pressure of disease, by adding the sufferings of Tantalus. In febrile affections, the irritation of thirst tends to keep up the disease, and hence diluents, besides the other beneficial effects which they may produce, must be regarded as important remedies. There are also diseases of the alimentary canal which may be removed by the same agents; when water is conveyed into the intestines it will have a tendency, by mixing with, and diluting the biliary secretion, to diminish its acrimony, and thus to obviate a source of morbid irritation; the dilution of the chyme and chyle may also have a salutary tendency, and favour the absorption of the finer and more nutritive parts by the lacteals; and by increasing the fluidity of the mass, expedite the numerous combinations which it is destined to undergo. The blood itself is also thus modified in its fluidity; although it has been very truly observed that in healthy bodies, or such as are without any obstruction of the excretions, an unusual distention of the vessels cannot be produced, or at least long subsist; for it is evident that such an increased quantity of water in the blood will immediately pass off by one or other of the excretions; this effect, however, in itself, renders the operation of diluents of signal service in the treatment of the disease; in consequence, for instance, of their disposition to pass off by urine, they furnish valuable resources in diseases of the urinary organs, allaying the pain of strangury, and the irritation from an inflamed bladder. From these observations, the practitioner will be led to appreciate the value of diluents; and many of the beneficial effects which are daily experienced from the copious potation of mineral waters, are, without doubt, to be wholly attributed to simple dilution. See *Aqua*.

With regard to the value of diluents, as capable of promoting the operation of other remedies, many observations of great practical importance might be adduced; but this subject will be more properly elucidated when we come to consider the influence of solubility in modifying the activity of medicinal substances.

EMOLLIENTS.

Substances whose application diminishes the force of cohesion in the particles of the solid matter of the human body, and thereby renders them more lax and flexible.

According to this definition, which we derive from Dr. Cullen, the primary operation of emollients would appear to be purely mechanical, for they are insinuated into the matter of the solid fibre, and either diminish its density, or lessen the friction between its particles; this explanation will undoubtedly apply to those emollients which consist of unctuous bodies, and which are introduced into the animal fibre by friction; but it is evident that the beneficial effects of *Cataplasms* and *Fomentations* cannot be so explained; for in this instance, none of the materials can be absorbed through the entire cuticle; and yet the relaxation and consequent ease which such warm applications produce on inflamed surfaces, is very considerable, but it must be wholly attributed to the relaxing effects of warmth and moisture upon the extreme vessels of the surface, propagated by *contiguous sympathy* to the deeper seated organs.

The operation of those substances which afford relief to excoriated surfaces by their bland qualities, as mucilaginous lotions in erysipelatous affections, is too obvious to require explanation.

Having thus investigated the manner in which medicinal substances produce their effects upon the living system, we shall be better prepared to appreciate the advantages which are to be derived from their combination with each other, and to escape the too common error of uniting in one formula, remedies which are rendered adverse by the incompatibility of their physiological actions.

ON THE

THEORY AND ART

OF

MEDICINAL COMBINATION.

> " *Variorum mixtura novas sæpe vires generet, in simplicibus nequaquam reperiundas longe saluberrimas.*"
>
> GAUBIUS.

ON THE

THEORY AND ART

OF

MEDICINAL COMBINATION

It is a truth universally admitted, that the arm of physic has derived much additional power and increased energy from the resources which are furnished by the mixture and combination of medicinal bodies. I do not mean to assert that the physician cannot frequently fulfil his most important indications by the administration of one simple remedy: I only contend that in many cases, by its scientific combination with other medicines, it will not only act with greater certainty and less inconvenience, but that its sphere of influence may be thus more widely extended, and its powers so modified or changed as to give rise to a remedy of new powers. Such a theory is amply justified by the state of combination in which certain medicinal principles are found in vegetable remedies, while the medicinal practice founded upon it is thus, as it were, sanctioned by Nature's own prescriptions; enter but her laboratory, and you will soon be satisfied, that many of her most efficient remedies do not owe their valuable powers to any one specific ingredient, but to the combined or modified energies of various, and sometimes opposite principles. This view of the subject opens an interesting and unexplored field* of medical and chemical research, and I shall endeavour to avail myself of the novelties its investigation may present, and the hints it may suggest for the improvement of *extemporaneous combination*. By contemplating the laws by which Nature effects her wise purposes, we may learn to emulate her processes, and even in some cases to correct and assist her operations: such at least has been the happy result of our labours in the other departments of natural knowledge; it was for instance by observing the means used by nature for preventing the diffusion of light in the eye-ball, that Euler derived an important hint for the improvement of his telescope; and more lately, the structure of the crystalline humour of the eye has been successfully imitated in the invention of achromatic lenses; on the other hand, it is hardly necessary to observe to what extent these instruments of art are capable of improving and multiplying the powers of that natural organ, to the contemplation of whose structure and functions, we are, as I have just stated, so greatly indebted for their origin and perfection. So shall I endeavour to show, in the progress of this work, that the combinations of nature, as exemplified in her more valuable remedies, are capable, if properly studied, of suggesting many important hints for improving the arrangements of art; while art in return may frequently supply the defects, or extend the advantages of natural compounds.

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* I selected it as the subject of my Lectures before the Royal College of Physicians, during the year 1820.

AN ANALYSIS

OF

THE OBJECTS TO BE ATTAINED BY MIXING AND COMBINING MEDICINAL SUBSTANCES.

THE objects to be attained, and the resources which are furnished by MEDICINAL COMBINATION, together with the different modes of its operation, and the laws by which it is governed, may with much practical advantage be arranged in the following order.

I.

TO PROMOTE THE ACTION OF THE BASIS, OR PRINCIPAL MEDICINE.

A.—*By combining together several different Forms, or Preparations, of the same substance.*

The utility of such a combination is obvious, whenever we desire the full and general effects of *all* the principles of a medicinal body in solution; thus, where the *Bark* is required in the cure of an intermittent fever, and the stomach will not allow the exhibition of the powder, it will be eligible to conjoin in one formula, the tincture, decoction, and extract. As exemplified by *Formulæ* 42, 126, 127. The necessity of such a combination may be expressed by the following canon. *Whenever the chemical nature of the medicinal substance will not admit of the full solution of all its active principles in any* ONE *Solvent, and its exhibition in substance is at the same time impracticable.* For farther illustrations see *Form.* 2, 25, 33, 38, 70, 109.

Practitioners, probably without having reasoned upon the theory, have very generally adopted the practice of combining the different solutions of the same substance; for in the prescriptions of practical physicians we commonly find, that the decoction or infusion of a vegetable remedy is quickened by a certain portion of a corresponding tincture.

B.—*By combining the Basis with Substances which are of the* SAME NATURE, *that is, which are* INDIVIDUALLY *capable of producing the same effect, but with less energy than when in combination with each other.*

Dr. Fordyce first established the existence of the singular and important law, that *a combination of similar*[*] *remedies will produce a more certain, speedy, and considerable effect, than an equivalent dose of any single one;* a fact which does not appear to have been known to any ancient physician. The earliest mention of it that I can find is by Valisnieri, the favourite pupil of Malpighi, who filled the medical chair at Padua in 1711, nearly ninety years before Fordyce published his valuable memoir on the combination of medicines, but he does not attempt any generalization[†] of the subject; he merely states, as the result of careful experiments, that twelve drachms of *Cassia Pulp* are about equivalent in purgative strength to four ounces of *Manna;* and yet, says he, if we give eight drachms of *Cassia Pulp*, in combination with four drachms of *Manna*, we obtain double the effect? How, adds the professor, can this possibly happen? Surely the very contrary *ought* to obtain, since four drachms of *Cassia* are much more than equivalent to an equal weight of *Manna;* the strength of the former being to that of the latter as 8 to 3.

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[*] The practitioner must receive the term *similar*, conventionally, as expressed at page 97. Many of those substances which we are at present bound to consider *similar*, will no doubt require to be transplanted into other classes as the progress of physiological knowledge shall elucidate their modes of action. In this attempt to teach the *Art of Medicinal Combination*, I have endeavoured to reduce the propositions it comprehends to the greatest degree of generality of which they are at present susceptible.

[†] Numerous isolated statements of the same tendency may be adduced, but these cannot invalidate the claim of Dr. Fordyce, as the first person who *generalised* the fact, and applied it with success to practice. Diemerbroeck, in his notes upon the *Theriaca Andromachi*, observes that the composition is a more efficacious medicine from the *concurrent* powers of so many ingredients, *alike in virtue*: and Quincy in his Lectures on Pharmacy, which were published by Dr. Shaw, in 1723, says, "those fetid gums which are generally prescribed in Hysteria, as *Ammoniacum*, *Galbanum*, &c. may be conjoined with advantage, *because from a concurrence of properties, they all conspire to the same end.*

The truth of this law of medicinal combination must be continually felt by the practitioner in the ordinary routine of his practice, viz.

Narcotics will better fulfil the intention of allaying irritation and pain, when composed of several of such medicines in combination, than when they consist of any single one, even should the dose, in this latter case, be increased. See *Formulæ* 3, 4, 5.

Antispasmodics acquire increased efficacy by the application of the same principle. *Form.* 20, 21, 22, 23, 24, 25.

Bitter Tonics are also thus exalted, see *Form.* 39, 40, 41. The beneficial effects, however, which arise from combinations of this kind will admit of a satisfactory explanation upon another principle; we may, for instance, consider them as medicines, differing from each other in their composition, and producing by their union an assemblage of bitter, astringent, and aromatic principles.

Aromatic and Diffusible Stimulants. There are perhaps no remedies which receive greater mutual benefit by intermixture with each other, than the individuals which compose this class; for they not only thus acquire increased force and efficacy, but at the same time they lose much of their acrimony; if, for instance, any one spice, as the dried capsule of the *Capsicum*, be taken into the stomach, it will excite a sense of heat and pain; in like manner will a quantity of *Black Pepper;* but if an equivalent quantity of these two stimulants be given in combination with each other, no such sense of pain is produced, but, on the contrary, a pleasant warmth is experienced, and a genial glow felt over the whole body; and if a greater number of spices be joined together, the chance of pain and inflammation being produced is still farther diminished. The truth of this law is also strikingly illustrated, as Dr. Fordyce has observed, by that universal maxim in cookery, *never to employ one spice, if more can be procured;* the object, in this case, being to make the stomach bear a large quantity of food without nausea. This same principle also finds an illustration of its importance, as it regards the class of stimulants, in the following preparations of our Pharmacopœia, viz. *Pulvis Cinnamomi Compositus*; *Infusum Armoraciæ compositum*; *Infusum Aurantii Compositum*; *Spiritus Lavendulæ compositus*; *Tinctura Cinchonæ composita*; and the *Confectio Opii*, the elegant and scientific substitute for the celebrated *Mithridate* or *Theriaca*. The practitioner is also referred to *Formulæ* 45, 47.

The local action of these stimulants would appear to be placed under the dominion of the same law, and perhaps the origin of the custom, so long observed, of mixing together the varieties of snuff, may thus receive a plausible and philosophical explanation; certain it is that by such combination the harsh pungency of each ingredient will be diminished, whilst the general potency of the application, in exciting the nerves, will be increased, and rendered more grateful; the same principle will direct the formation of safe and efficient plasters and lotions; the *Emplastrum Cumini* of the London and the *Emplastrum Aromaticum* of the Dublin Pharmacopœia, offer examples of its judicious application.

ASTRINGENTS. For illustration see *Formulæ* 51, 58.

EMETICS are certainly more efficient when composed of *Ipecacuan* united with *Tartarized Antimony*, or *Sulphate of Zinc*, than when they simply consist of any one of such substances in an equivalent dose. See *Form.* 63, 65.

CATHARTICS not only acquire a very great increase of power by combination with each other, but they are at the same time rendered less irritating in their operation; the *Extractum Colocynthidis compositum* affords an excellent example of a compound purgative mass being much more active and manageable, and less liable to irritate, than any one of its components separately taken. Additional examples of this fact are furnished by *Formulæ* 70, 76, 78, 79, 81, 88. In many cases, however, the fact of purgatives thus accelerating and correcting each other's operation may be explained by considering them as substances endowed with different powers, as already demonstrated, (p. 118) and which will be more fully considered in the third division of this Essay.

DIURETICS. Under this class of medicinal agents it may be observed that, *whenever a medicine is liable to produce effects different from those we desire, its combination with similar remedies is particularly eligible*, by which the action of the basis may be directed and fixed; thus the individuals which compose the class of Diuretics are uncertain in their operation, and disposed when exhibited singly to produce diaphoretic, and other contrary effects; it is, therefore, in such cases, highly judicious to unite several of them in one Formula, by which we increase their powers, and are more likely to ensure their operation. *Formulæ* 101, 103, 108, 109, 110, 111, 115, are constructed upon this principle.

DIAPHORETICS. Our maxim, "VIS UNITA FORTIOR," certainly applies with equal truth to this class of medicinal agents. *Form.* 122, 124.

EXPECTORANTS. More is frequently to be gained by the co-operation of these remedies than can be obtained by the exhibition of them separately, as in *Form.* 134, 135.

DEMULCENTS do not appear to obtain any other benefit from combination than, occasionally, a convenience and efficacy of application arising from a suitable degree of consistence and solubility. See article "*Trochisci.*"

The operation of the law which has thus formed the first object of this inquiry, will be found, like every other, to have a natural and well-defined limit; it is easy to perceive that by multiplying the number of ingredients too far, we shall either so increase the quantity and bulk of the medicine as to render it nauseous and cumbersome, or so reduce the dose of each constituent as to fritter away the force and energy of the combination.

The propriety of combining *several* stimulants, of the diffusible class, in *one* formula, has been questioned on different grounds; Dr. Chapman, in his work on Therapeutics, adduces some arguments on this point which, although they fail in establishing his general position, certainly suggest an important exception to the practice in question; "by directing," says he, "stimulating remedies, *separately*, we shall economize our resources in many lingering diseases." The justness of this statement must be admitted to its fullest extent, and practitioners will, on certain occasions, do well to act in conformity with the views that suggested it; for instance, in the feeble forms of protracted fevers, where the indications are to be met with the continued action of stimulants, it will certainly be salutary to alternate the use of *camphor*, *ammonia*, and other remedies of a similar nature, in preference to presenting them all at once in combination, so that the system may not lose its susceptibility by the continued impression of the same stimulant; the same motive should induce us, on particular occasions, to employ in succession different narcotics, for each of them affects sensibility in its own peculiar manner; the nervous system, as *Richerand* has very justly observed, may be compared to a soil, rich in different juices, and which requires the cultivator to plant the germs of a diversified vegetation to develope the whole of its fecundity; to ensure a perpetual return therefore, it will be right to sow a succession of different seeds. Hoffman also has offered us some advice upon this subject; he directs us in the treatment of chronic diseases to suspend the administration of remedies at intervals, and afterward to resume them, lest the system should become *habituated*, and ultimately *insensible* to their influence.

But there remains for our investigation a still more important precaution respecting this law of medicinal combination; that in combining substances in the manner, and for the object just related, the practitioner should be well satisfied that their medicinal virtues are in reality *practically* SIMILAR, or he will fall into an error of the most fatal tendency; it has been already shown, and I hope I shall not be considered tedious by again directing the reader's attention to the fact, that medicines are not necessarily similar because they have been arranged in the same artificial division of remedies; in order to establish a perfect similarity *their operations must be found by experience to continue similar under every condition of the human body; and, that, moreover, they must owe such similarity to modes of operation which are compatible with each other, and consonant with the general mode of cure;* we have only to refer to the history of Diuretics (*page* 123) for a full illustration of this important truth: thus *Squill*, *Calomel*, and *Digitalis*, are each powerful Diuretics, but nevertheless they cannot be considered *similar* remedies, since *Digitalis* will entirely fail in its effects in the very cases that *Calomel* and *Squill* succeed; and *Squill* will prove inert when *Digitalis* is capable of producing the most powerful influence; this arises from their modes of operation being so dissimilar, and consequently requiring for their success such different states of the living system. *Squill*, it will be seen, acts *primarily* on the urinary organs, by stimulating the secreting vessels of the kidneys; *Mercury*, on the contrary, acts primarily on the absorbents, and *secondarily* on the kidneys; whereas *Digitalis* produces its effects by diminishing arterial action, and increasing that of absorption.

Dr. Blackall, in his "Observations upon the Cure of Dropsies," has offered some remarks so valuable in themselves, and so illustrative of this important subject, that I shall take leave to quote the passage. "Many physicians," he observes, "are fond of combining *Squill*, *Calomel*, and *Digitalis*, as a diuretic in dropsy; a practice unsafe, and not very decidedly possessing the merit even of being consistent. *Digitalis* greatly depresses the action of the heart and arteries, and controls the circulation, and it seems most unreasonable to believe that its curative powers can be independent of such an effect; on the other hand, *Mercury*, if it does not pass off quickly, is always exciting fever, and raising and hardening the pulse; speaking from experience, where the urine is coagulable, and *Digitalis* agrees, both the others are, often at least, positively injurious. On the contrary, where the urine is foul, and not coagulable, and *Squills* with *Calomel* render service, I have on that very account, made less trial of Digitalis, and cannot therefore speak of it from much experience." See *Form.* 103, and the *note* thereon.

The individual medicines which compose the class of Diaphoretics vary no less in their primary operations, as the synoptical arrangement at *page* 130 very fully exemplifies; thus, in the cure of intermittent fevers, diaphoretics are useful both in the paroxysm, and during the intermission; in the first case they shorten its duration; in the second they support the tone of the extreme vessels, and prevent its recurrence; but in these opposite states of disease a very different kind of diaphoretic is required—to fulfil the first indication, a cooling and relaxing one is necessary; to answer the second, the stimulating diaphoretic is exacted; the one may be said to *solicit*, the other to *extort* perspiration. So again Emmenagogues can only be considered relative agents, since the suppression of the catamenia may depend upon, or be connected with, very different states of the system; in some cases with a diminished, and in others with an increased state of excitement; for on many occasions the suppression of the menses is the effect, and not the cause of disease; *Boerhaave* has very justly observed, that it is a most dangerous error to ascribe all the diseases of young females to a retention of the catamenia, which often do not appear because the patients are disordered from other causes. If, therefore, we were to attempt a combination of the several medicines which have gained reputation, as *Emmenagogues*, it is very obvious, that we should bring together an assemblage of adverse and incompatible remedies; nor would the physician be less inconsistent were he to combine Expectorants, without a due regard to their modes of operation; it is only necessary to observe their classification, as presented at page 133, to become satisfied how greatly the success of such remedies must depend upon their scientific adaptation to each particular case.

The class of Antispasmodics may likewise embrace remedies of the most opposite tendency, for spasm may occur under the most opposite circumstances—in an extreme condition of weakness, as in nervous affections, and in an highly excited state, as in cholic, &c.; it is hardly necessary, therefore, to point out the mischief that must arise from the fortuitous and indiscriminate admixture of the individual substances which are thus unavoidably arranged in the same artificial classification. *Bark* and *Steel* are also too often considered as equivalent *Tonics;* in Dropsy, says Dr. Blackall, it is far otherwise, the former being infinitely to be preferred after the dropsy of young persons, of acute disease, and of sound stamina; the latter being suited to a vitiated rather than to a feeble habit, and indicated more by a pale sallow complexion, and a want of red colour in the blood, as shown by the paleness of the lips, than by any other signs. Need we then adduce farther illustrations of the obvious but important fact, that the terms employed to denote the different classes of remedies are frequently but relative ones, expressive of effects which are produced only in reference to a particular state of the living body? and as this necessarily varies in different states of health and disease, it follows that medicines are convertible agents, and that when we attempt to institute general rules respecting their administration, without taking into consideration the constitution and circumstances of the patient upon whom they are to operate, we shall generally be disappointed in the result. We may say of medicines what Van Swieten said of diet, "to assert that such, or such a thing, be wholesome, without a knowledge of the condition of the person for whom it is intended, is like a sailor pronouncing the wind to be fair without knowing to what port the vessel is bound." Boerhaave was so fully impressed with this truth that he exclaimed, "*nullum ego cognosco remedium, nisi quod tempestivo usu fiat tale.*"

Although medicines which produce the same ultimate effects by modes of operation obviously different, cannot be considered SIMILAR, in the sense affixed to the term in the present section, yet if these different modes of operation be not physiologically incompatible with each other, the union of such remedies may not only be admissible, but even useful; and it will, accordingly constitute an object of inquiry in a succeeding section. (III *a*.)

C.—*By combining the Basis with Substances of a* DIFFERENT NATURE, *and which do not exert any Chemical influence upon it, but are found by experience to be capable of rendering the Stomach, or System, or any particular organ, more susceptible of its action.*

Thus it is that the system is rendered more susceptible of the influence of Mercury, by combining it with Antimony and Opium.* Where the stomach is insensible to impressions, the exhibition of Opium previous to, or in combination with, any active medicine, often assists its operation; this is frequently seen in mania, when emetics will fail, unless the stomach be previously influenced and prepared by a narcotic; so again the system, when it is in that particular condition which is indicated by a hot and dry skin, is unsusceptible of the expectorant powers of Squill, unless it be in union with antimony or some powerful diaphoretic, (*Form.* 134.) Squill is by no means disposed to act upon the urinary organs, when exhibited singly; but calomel, and some other mercurial preparations,† when in conjunction with it, appear to direct its influence to the kidneys, and to render these organs more susceptible of its operation; (103, 106.) Upon the same principle, *Antimonial Wine* quickens the operation of saline cathartics (69); *Opium* increases the sudorific powers of *Antimony* (124); and the purgative operation of *Jalap* is promoted by *Ipecacuan*, (84.)

Sir John Pringle speaks of the advantages which may be obtained by combining an alkali with a bitter infusion, by which the diuretic effects of the former will be increased, while the latter is calculated to remove any gastric debility, and to impart a general tone to the body: there is no doubt but that *Bitters*, from their invigoratiug influence upon the *primæ viæ*, (*see page* 106) increase the effects of remedies whose operation is connected with changes *in transitu*, or with absorption, as in the exhibition of certain diuretics;‡ they also frequently render the stomach and bowels more susceptible of bodies that act by impression, as purgatives, emetics, &c.

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* It would even appear probable that in some cases mercurial influence has, after its subsidence, been renewed by doses of Opium: a remarkable instance of this kind is related in Hufeland's Journal (vol. ix.) in which an old woman is said to have fallen into a considerable salivation after every dose of Opium; she had previously applied to the physician for an extensive ulceration over her body, and had taken a considerable quantity of mercury; but the effects had subsided, until renewed by the opium.

† *Sir Gilbert Blane* has advanced a very ingenious hypothesis to explain the cause of the fœtid breath of persons under the influence of mercury; the same hypothesis might perhaps show why certain remedies are rendered more efficient by combination with mercury. One of the active effects of mercury, says Sir Gilbert, is to *alter the natural sensibility of the Lacteals*, so that when under its influence, they absorb indiscriminately that which is excrementitious and nutritive; hence the smell of the breath, since the fœtid particles are carried into the circulation, and thrown off in the *halitus* of the lungs, or by the salivary glands, in consequence of the mouths of the lacteals losing that selecting tact, whereby in their sound state they reject whatever is offered to them, except the chyle.

‡ In some cases, however, the energy of an active bitter would seem to be diminished by an alkali; and it may therefore be more prudent to administer such substances at different periods. I apprehend that the powers of *Squill* are thus invalidated by a fixed alkali.

We may discover the operation of such a principle in some of the more active compounds presented to us by nature: many herbs owe their efficacy to a cause of this kind. *Elaterium*, as I have ascertained by experiment, contains a purgative element, *sui generis*, (*Elatin*) and a bitter principle, which in itself is quite inert, and yet its presence in the compound renders the alimentary canal more susceptible of the impression of the active ingredient, and therefore increases its force. See *Extract Elaterii*. The history of *Senna* will afford some interesting facts in farther elucidation of this subject; the leaves of this plant, like *Elaterium*, appear to contain an active principle in combination with a bitter, which latter ingredient, although destitute of purgative properties, considerably increases those of the former; for if this be removed, as happens when Senna is transplanted into the south of France, the purgative principle is weakened, but may be again restored by the artificial addition of some bitter extractive. The fruit or pods of Senna* contain only the purgative principle, and are therefore comparatively feeble unless the defect be compensated by art: Dr. Cullen has observed that a much smaller quantity of the leaves is required for a dose if they be infused in company with some bitter plant; and it has been found that the watery infusion of *rhubarb* is rendered more purgative by the addition of *calumba*.

The experiments of Seguin have established beyond all doubt that the active principle of vegetable astringents is a peculiar element, to which the name of *Tannin* has been given; but the efficacy of this ingredient is undoubtedly enhanced by the presence of the gallic acid with which it is usually associated, although this acid, when separated from the native combination, is incapable of producing the least astringent effect; that peculiar flavour which we so commonly experience in unripe fruits, and which we designate by the term *acerbness*, is the result of a combination of the astringent principle with some vegetable acid. The relative sweetness of sugar, when in different degrees of purity, depends upon the operation of the same law of combination; *pure sugar*, as Dr. Mac Culloch has very justly observed, however paradoxical it may appear, *is not so sweet as that which is impure;* the sweetness of *melasses*, compared with that of refined sugar, is too well known to require more than a bare mention; the vegetable extractive matter in this case, increases the effect of the saccharine principle with which it is combined; for the same reason grapes, differing very materially in their proportion of saccharine matter, may seem *to the taste* equally sweet, and such in fact is the case on comparing the luscious grapes of Spain, with the *Chasselas* of Paris; and yet the vinous produce is entirely different, the result of the one being a sweet and luscious wine, while that of the other is hard and dry, because in truth, these grapes contain very different proportions of sugar; and however powerfully the extractive matter may modify the effects of this principle upon the palate and organs of taste, it cannot alter the quality of alcohol resulting from its fermentation.* Crystallized sugar also appears less sweet than loaf sugar, but this may depend upon the different state of aggregation, and consequently, the different degrees of solubility possessed by the sugar in these two forms.

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* The Arabian and Greek physicians scarcely noticed the leaves, but always employed the pods of Senna; a fact which will explain the operation of this plant, as observed by them.

In some cases, the addition of certain bodies will induce the absorbents to admit and carry into the circulation remedies which, in a more simple state, they would reject as injurious; this position is supported by the fact of mercury being more readily absorbed when in combination with animal matter, see *Ung: Hydrarg:* and it is probable that iron, in the form of a *tanno-gallate*, will be more acceptable than when presented in a more purely mineral state: see *Ferri Sulphas*. Does it not therefore appear that *certain elements exist in the composition of vegetable remedies, as furnished by nature, which, although individually inert, confer additional strength and impulse upon the principle of activity with which they are associated.*†

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* *Mac Culloch on Wine. Edit.* 2, *p.* 42.

† If the facts stated in this section be true, we are bound to recognise two orders of medicinal elements,—the one comprehending those that possess an inherent and independent activity,—the other, those that are in themselves inert, but which are capable of imparting impulse and increased energy to the former when combined with them. As this is a new view of the subject of vegetable combinations, no apology is necessary for the introduction of new terms for its explanation; I therefore propose to designate the former of these SUBSTANTIVE, and the latter, ADJECTIVE constituents. When the structure of vegetable remedies shall have been thoroughly examined upon this principle of combination, much medicinal obscurity will be removed, and probably some pharmaceutical improvements of value suggested; at all events it will teach a lesson of prudent caution to the pharmaceutic chemist; it will show the danger of his removing this or that element from a vegetable compound, merely because he finds, upon its separation, that it is inert. I dwell the more upon this point, because I feel that there never was a period in the history of medicine, at which such a caution was more necessary; for while the poly-pharmacy of our ancestors has driven the physician of the present day into a simplicity of prescription that on many occasions abridges his powers and resources, the progress of chemical,

The solutions of saline cathartics appear likewise to gain an accession of power and celerity of operation by impregnation with *Carbonic acid gas*, depending probably upon the intestines thus receiving a degree of distention favourable to the action of the salt, (19. 23.) Certain it is that the operation of emetics as well as that of clysters is materially increased by the stimulus of distention.

In enumerating the methods to be adopted for increasing the energies of a remedy, by rendering the system more susceptible of its action, it is right to know that under certain circumstances Venesection deserves a distinguished rank among the ADJUVANTIA. The fact is strikingly discovered in the exhibition of *Mercurial Preparations*,* and some other alterative

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knowledge has diffused through the class of manufacturing chemists a bold spirit of adventure and empiricism,—a mischievous propensity to torture our best remedies, in order to concentrate or extract the parts which they consider to constitute their essential ingredients.

A Memoir has lately been presented to the PHILOMATIC SOCIETY OF PARIS, by *M. Robiquet*, on the subject of *Aroma*, which affords some important analogies in proof of the law of combination, which I am now endeavouring to elucidate. From the experiments of this laborious chemist it would appear, that odours are not, as *Fourcroy* supposed, *the effect of the simple solution of certain bodies in air*, but that for their developement, some third body (coinciding in its office with my ADJECTIVE constituent) possessing in itself none of the characteristic odour, is absolutely necessary as an intermede, varying in its nature according to that of each odorous body, in the same way that the mordant requires to be varied by the dyer, according to the nature of the colouring matter which it is intended to fix on the cloth;—thus *Ambergris* has in itself very little odour, but the addition of *Musk* developes a very strong and decided one; this also happens in a less degree with Lavender, and the perfumers therefore add a small quantity of musk to the distilled water of this plant. In other cases, *Ammonia* lends, as it were, its volatility to bodies, the odour of which, without such an auxiliary, would be scarcely sensible; this is exemplified by the practice of perfumers exposing their *musk* and other substances to the atmosphere of privies when they loose their power; (*Paul Amman: Manduct: ad Mat: Med:*) so again in order to give pungency to snuff it is made to suffer the commencement of fermentation, in which case, ammonia is generated; and it is a curious fact that the odour of the best snuff may be destroyed by mixing with it a little tartaric acid, by which its ammoniacal salt is neutralized. In some instances the *adjective* ingredient seems to be *Sulphur*, as in the essential oils of some cruciform plants, and particularly in that of mustard seed, for M *Robiquet* found that this oil lost its odour by being kept in contact with a metallic surface, and that an inodorous oil remained, while the metal became a sulphuret: perhaps, adds *M. Robiquet*, it may be sometimes necessary for the full and exquisite developement of odour in these bodies, to add another vehicle, thus the addition of a little *Acetic acid* heightens the odour of *Mustard*.

Iron has little, or no odour; but when volatilized with hydrogen, its odour is very powerful. The smell of copper and brass must depend upon some circumstance, not well understood.

* In a practical treatise on Tropical Dysentery; lately published by Mr. Bampfield, a Surgeon in his Majesty's ships Belliqueux and Warrior, serving in the East and West Indies, the author states that ptyalism is the most effectual cure, but that this can rarely be induced without previous bleeding and purging.

medicines. Whether the "*Vis Conservatrix*," which Nature when in a state of health and vigour opposes to the admission of poisonous substances into the circulation, be overcome by blood-letting, is a question which I shall leave others to decide; but thus much reiterated practice has taught me, that the system in a strong and healthy condition frequently is overcome the moment the stomach becomes deranged, the circulation languid, or the general tone of the system impaired. I have frequently seen this during my Hospital practice: if a patient who has been using mercurial friction, or taking the preparations of that metal without effect, be transferred into a close and unhealthy ward, his appetite soon fails, the tongue becomes furred, and the system instantly yields to the influence of the remedy. Nauseating doses of *antimony* frequently repeated, or the accidental supervention of any disease of debility, will be attended with the same phenomena. My practice has also afforded me an opportunity of appreciating the debilitating effects of despondency in a case of this description; a patient had been taking mercurial medicines, and using frictions for a considerable period, without any apparent effect: under these circumstances he was abruptly told that he would fall a victim to his disease; the unhappy man experienced an unusual shock at this opinion, and in a few hours became violently salivated.*

Venesection, moreover, increases the effects of cathartic medicines. I have often noticed this fact in contending with a plethoric diathesis; whenever the bleeding preceded the purgative, the effects of the latter have been uniformly more speedy and considerable; in obstinate constipation the same fact has been observed, and mild remedies have been known to act more powerfully, when preceded by blood-letting, than potent ones have when exhibited antecedent to it. Venesection has certainly an extraordinary power in awakening the susceptibility of the *primæ viæ* to remedial impressions: in some diseases, as in *Cynanche Trachealis*, or Croup, so great is the insensibility of the stomach, that emetics frequently fail

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Astruc, and other practitioners of the same school, always premised a mercurial course with venesection: it is probable that many of the anomalies observed in the modern application of this remedy may have arisen from an inattention to the diet of those who are under mercurial influence. Mercury is in itself a most powerful stimulant, and ought therefore to be accompanied with depletion and low diet; besides which, the experiments of *Majendie* have shown how greatly such a state of the system will expedite the effects of the mercurial remedy.

* Fear, contrary to joy, decreases for a time the action of the extremities of the arterial system, as is seen by the sudden paleness which succeeds, and the shrinking or contraction of the vessels of the skin.

in their effects; and Dr. Hamilton has given as much as a hundred grains of *Calomel* in the twenty-four hours: in such cases previous venesection affords most extraordinary assistance. Dr. Fothergill also remarks that emetics are more beneficial after bleeding, (*Dissert. Med. Inaug. de Emet. usu.*) The effects of *Bark. Steel*, and other tonics, are certainly influenced in the same manner; whether in any case it may be prudent or judicious to have recourse to such a practice, is a question not immediately connected with the present inquiry.

Purgatives also awaken the susceptibility of the body to mercurial impressions, and it is remarked by Dr. Chapman that this practice affords a resource which rarely disappoints the practitioner: this class of remedies moreover seems capable of exalting the efficacy, and indeed of accelerating the benefit to be derived from many alteratives, when administered *previous* to the exhibition of these latter substances; the advantages of a course of Steel medicines are undoubtedly increased by such means. The febrifugous and antiseptic properties of diluted muriatic acid (see *Form.* 145.) are inconsiderable, unless its exhibition be accompanied with cathartics. I beg to refer the practitioner to some cases published by me in the *Medical and Physical Journal for December*, 1809, in further illustration of these views. Experience enables me also to state that *Diuretics* are considerably assisted by similar means, having many instances in my case book of the failure of these agents before, and their successful operation after, the exhibition of a cathartic. Dr. Darwin observes, that "*Absorptions are always increased by Inanition*," and in support of this position refers to the frequent advantage derived from evacuations in the cure of ulcers. I have certainly seen obstinate sores in the leg cured by small and repeated bleedings. Dr. Chapman arrives at the same conclusion, although by a different train of reasoning; he states that the blood-vessels and absorbents* are to a certain extent antagonising powers: instructed by this obvious fact, we ought, says he, in the exhibition of diuretics to regulate the state of the system by interposing purgatives, or even venesection, as the state of the circulation may indicate.

Change of Diet and of Habits may be also classed among the *Adjuvantia*, but the young practitioner must be warned that he is not to exercise his *Caduceus* as Sancho's Doctor did his wand. I have seen a young disciple of Esculapius so vex his patient, that his food became more nauseous to him than his medicine, and I verily believe his Physician was more irksome than his disease. It it well observed by Dr. Percival, that the prejudices of the sick should never be contemned with wantonness, or opposed with harshness; for though silenced by authority, they will operate secretly and forcibly on the mind, creating fear, anxiety, and watchfulness. And with regard to diet it may be here stated, that no function of the body is so materially influenced by mental impressions as that series of actions constituting what is termed *Digestion*—the unexpected communication of any distressing event destroys the keenest appetite, and converts the sensation of hunger into one of disgust at the bare idea of food; a fact which did not escape the penetrating eye of our immortal Shakspeare, for he represents Henry dismissing Wolsey from his government with these words—

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* How admirably the results of Majendie's Experiments coincide with this reasoning; see page 116.

> ——— Read o'er this;
> And after, this: and then to breakfast
> *with what appetite* you have.

If feelings of disgust are excited by the repast, the stomach will never act with healthy energy on the ingesta; and in cases of extreme aversion, they are either returned, or they pass through the alimentary canal almost unchanged: on the other hand, the gratification which attends a favourite meal is in itself a specific stimulus to the organs of digestion, especially in weak and debilitated habits. Dr. Merriman has lately communicated to me a case which affords a striking illustration of the powerful influence of the mind upon these organs: a lady of rank labouring under menorrhagia, suffered with that irritable and unrelenting state of stomach which so commonly attends that disease, and to such a degree that every kind of aliment and medicine was alike rejected: after the total failure of the usual expedients to appease the stomach, and procure relief, she applied to Miss Prescott, and was *magnetized*, when she immediately, to the astonishment of all her friends, ate a beef-steak, and continued to repeat the meal every day for six weeks, without the least inconvenience; but the disease itself, notwithstanding this treacherous amnesty of the stomach, continued with unabated violence, and shortly afterward terminated her life.

The diet of a sick person ought never to *combine too much nutriment in too small a space*;* when so given it will even in health be followed by *fermentation* instead of *digestion;* and although we may admit the expediency of that domestic maxim, "*a little, and often,*" yet this is to be received with limitation; no one, for instance, who possesses any philosophical knowledge, will adapt his practice to the notions of Sir William Temple, who asserted that the "stomach of a valetudinarian was like a school-boy, always doing mischief when unemployed," and that we should therefore not allow it any interval of repose: to this I answer, that the conversion of aliment into blood is effected by a series of elaborate processes, several of which are only perfectly performed during the quiescence of the rest: it would seem for instance that the process of *chylification* is incompatible with that by which the first changes are produced in the stomach; this is evident from the well-known fact, that our appetite for food ceases when the former process commences, although the repast should, at the time, have been insufficient to satisfy the cravings of nature: whereas, in diseases of imperfect, or depraved digestion, as in *Diabetes*, *Tabes Mesenterica*, &c. we find that the appetite for food is never satisfied by the most nutritive meals. It merits notice also, that whenever the stomach be called into action during the assimilating stages of digestion, the process will, in weak persons, be much disturbed, if not entirely suspended. These views have long since confirmed me in the propriety of treating mesenteric affections in a manner very different from that which is generally pursued; and I may add that the result has been very satisfactory: the plan consists in enforcing longer intervals between each meal, which should be scanty, and in quantity short of what the appetite may require; in this way the unwilling absorbents are induced to perform their duties; but it is a practice, which, from the extreme anxiety of friends and relatives, the feelings of craving and hunger expressed by the patient, and the mistaken but universal prejudice respecting

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* The capacity of our digestive organs sufficiently testifies that nature never intended them for the reception of highly concentrated food, while this idea is farther strengthened by perceiving how sparingly she produces

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concentrated aliment; the saccharine matter of esculent fruits is generally blended with acidulous and mucilaginous ingredients; and the oleaginous principle of seeds, kernels, and other similar substances, is combined with farinaceous matter: the capacity observable in the organs of graminivorous animals evidently shows that they were also designed for a *large bulk* of food, and *not* for provender in which the nutritive matter is concentrated; the gramineous and leguminous vegetables do not present their nutritive matter in a separate state, nor is the animal furnished with an apparatus by which he can separate the chaff and straw from the grain,—the obvious inference is, that he was intended to feed *indiscriminately on both.*

Some years ago I constructed a Logometric scale of Equivalents, to show the relative nutritive powers of different vegetables, and to work problems connected with them; I found, however, that unless *bulk* was taken into calculation, it was incapable of furnishing even an approximation to truth.

diet, it is always painful to propose, and generally impossible to enforce; where, however, circumstances have given me full control, the advantage of the plan has been most decisive.

II.

TO CORRECT THE OPERATION OF THE BASIS, BY OBVIATING ANY UNPLEASANT EFFECTS IT MIGHT BE LIKELY TO OCCASION, AND WHICH WOULD PERVERT ITS INTENDED ACTION, AND DEFEAT THE OBJECTS OF ITS EXHIBITION.

A. *By* MECHANICALLY *separating, or* CHEMICALLY *neutralizing, the offending Ingredient.*

The scientific physician, from his knowledge of the chemical composition of a medicine, and of the principles upon which its different qualities depend, is enabled to remove or render inert the element which imparts to it a deleterious operation; thus it has been found that the peculiar principle in the *Spanish Fly*, which so frequently irritates the urinary organs, is soluble in boiling water; ebullition in water therefore offers the means of depriving it of the power of thus acting upon the kidneys, while it does not effect any alteration in its vesicatory properties. It is upon the same principle that many vegetable substances of a very acrid nature become harmless by boiling, or by chemical manipulation, and some of them might even in times of scarcity and want, be introduced as wholesome and nutritious articles of diet. The experiments of *Westring* show that the bitterness of the *Lichen Islandicus* may be entirely removed by maceration in an alkaline ley, and a tasteless, but highly nutritious fecula be thus obtained; in the same manner, the *Æsculus Hippocastanum* (Horse Chesnut) may be deprived of its bitterness, leaving a residuum which will afford a kind of bread; and according to *Parmentier*, (*Recherches sur les vegetaux nourissans*,) excellent starch may be also made from it. *Dr. Darwin* observes, that if the roots of *White Bryony* be rasped into cold water, and agitated with it, the acrid juice of the root along with the mucilage will be dissolved, or swim in the water; while a starch perfectly wholesome and nutritious will subside, and may be advantageously used as food; by a similar species of address the French prepare from the acrid *Arum* the harmless, but highly prized cosmetic, called *Cyprus powder*.

There are many substances which receive a much pleasanter mode of operation by having their solubilities increased or diminished; thus the griping occasioned by several drastic purgatives is obviated by the addition of some alkali; and the nauseating tendency of *Camboge*, which arises from its too easy solubility, is prevented by incorporating it with some insoluble body; as in the *Pilulæ Cambogiæ Comp:* but the farther consideration of this question will be resumed in the fourth section of the Analysis. (iv. c.)

Numerous attempts have been made to correct the inconvenient effects of *Opium*, such as nausea, headach, and costiveness, by removing the resinous element, upon which such evils have been supposed to depend, and we have accordingly been at different times presented with a variety of *Formulæ* for the accomplishment of so desirable an object; (*see Opium*,) it is however probable that we shall be indebted to a different species of pharmaceutical address, if ever we succeed in so modifying the powers of this potent remedy, as entirely to divest it of its unpleasant properties.

B. *By adding some substance capable of guarding the stomach or system against its deleterious effects.*

The virtues of our most important remedies are frequently lost, or much invalidated, for want of proper attention to the circumstances comprehended in this section. It may be almost admitted as an axiom that *whenever an Alterative Medicine acts with violence upon the primæ viæ, its energies are uselessly expended, and the object of its exhibition defeated.* So again, *Diaphoretics*, *Diuretics*, and many other remedies, suffer a diminution in their effects, whenever they stimulate the stomach or bowels to excess. *Guaiacum* thus loses its anti-arthritic, *Squill* its diuretic, and *Antimony* and *Ipecacuan* their diaphoretic virtues; the action of these substances may therefore require correction, and a medicine must be selected capable of fulfilling that intention. *Opium* has very extensive powers as a corrigent. *See Form.* 57, 100, 106, 110. Dr. Mead combined alkaline salts, when intended to act as diuretics, with opium, in order to prevent their action upon the bowels: *Super-acetate of Lead*, when administered in cases of hæmoptysis, or uterine hemorrhage, should also be guarded by the addition of a small portion of the same narcotic; the griping and nauseating tendency of some remedies receives correction by the addition of *Aromatic stimulants*, or *Essential oils*, (69, 71, 78, 84, 85, 92,) or by small portions of a corresponding tincture, (70, 76.) It has been already stated, that the griping from *Senna* and *resinous* purgatives may be, in a great degree, obviated by the addition of alkalies; it remains to be observed, that the same remedies are also mitigated in severity, by *saline* purgatives, (77.) I learn from Sir Henry Halford, that in his practice he has found the addition of *Extract of Hyoscyamus* to render the operation of the *compound extract of Colocynth* much more mild, and no less efficacious. *Alum* is corrected in its tendency to disturb the bowels by the addition of *Nutmeg*, (*Form.* 53) or some aromatic; and the drastic operation of *Colocynth* may be mitigated by trituration with *Camphor*. There are several substances which are deprived of their acrimonious qualities by trituration with mucilage, milk, barley-water, &c. The tendency which mercurial preparations possess of affecting the bowels, is, with the exception of *Corrosive Sublimate*, corrected by *Opium*, but the acrid operation of this latter salt is more securely guarded against by the decoction of *Guaiacum* or *Mezereon*, or by the plentiful exhibition of mucilaginous drinks and broths; in certain diseases of the uterus and vagina, astringent lotions are indicated, but it may happen, as in the cauliflower excrescence; or in the oozing tumour of the labium, that such applications are too irritating; in such cases the effect of the lotion is *corrected* by the addition of mucilage. The enfeebling influence of *Digitalis*, *Tobacco*, and some other narcotics, is successfully opposed by aromatics and stimulants. It has already been stated that several attempts have been made to correct the operation of *Opium* by the application of mechanical and chemical resources; it would, however, appear that, for obviating its effects upon the intestinal excretions, the judicious addition of some purgative will offer the most effectual corrigent; and according to my own experience, the *Aloetic* preparations are to be preferred upon such an occasion, as in *Form.* 11, 12, 13. In some cases, I have found that a combination of the watery infusion of *Opium* with some bitter, will secure the narcotic virtues, without those consecutive effects upon the alimentary canal, which we are always so desirous to obviate; the *Decoctum Aloes compositum* also furnishes upon such an occasion a very appropriate adjunct; let us remember that one of the effects of opium is to paralyze, for a time, the muscular fibres of the intestines: now experience has taught us that the remedies above directed have a peculiar tendency to augment the peristaltic motions of the *primæ viæ*.

In general, a formula contains but one *corrigent;* but circumstances may occur, where two different ingredients are required to obviate two very different effects, as in *Form.* 16, in which the *Nitric acid* is introduced for the purpose of counteracting the deleterious effects of the opium upon the nervous system, while the *Aloetic* preparation is calculated to obviate its particular tendency upon the alimentary canal.

Sometimes the unpleasant or perverse operation of a medicine may be obviated by changing the form of its exhibition, the period at which it is taken, or the extent of its dose; Dr. Cullen, for instance, found that the nauseating operation of *Camboge* might be obviated, by repeating small doses at short intervals. (89.)

Before quitting the present subject, it deserves notice, that there is frequently a *chemical* condition of the stomach that may interfere with the mild operation of a medicine, and may therefore require consideration: this is particularly exemplified in the action of those antimonial preparations which are liable to become emetic and drastic by the presence of an acid; it is, for this reason, very eligible to guard such substances with antacid adjuncts. See *Antimonii Sulphuretum,* and *Form.* 125, 128.

The vinous infusion of *Colchicum* appears to act more violently when acid is present in the stomach; small doses of *Magnesia* may therefore precede, and accompany its exhibition with advantage.

III.

TO OBTAIN THE JOINT OPERATION OF TWO OR MORE MEDICINES.

A. *By uniting those substances which are calculated to produce the* SAME ULTIMATE RESULTS, *although by totally different modes of operation.*

It has been already stated, (*page* 185) that we may frequently combine substances together whose modes of operation are dissimilar, with considerable advantage, provided they be not physiologically incompatible with each other. We may illustrate this subject by a reference to the operation of purgatives; a series of medicinal substances may be produced, each of which has the property of exciting catharsis, but by a very different mode of action, one for instance stimulates the muscular fibres of the intestines; a second acts upon the exhalant vessels, and mucous glands; and a third exerts its influence upon the neighbouring organs, so as to produce an increased flow of their secretions into the bowels; but since such modes of action are quite compatible with each other, they may be simultaneously established, not only without any loss of efficacy, but with the most decided advantage; suppose, for instance, we administer a substance which, either from its insolubility or peculiar nature, acts exclusively upon the muscular fibres of the alimentary canal, its peristaltic motions will be undoubtedly thus increased, and the contents of the bowels evacuated, but the operation will be slow, and probably accompanied with considerable *tormina;* now it is evident that if to such a remedy, we add those which can produce an increased flow of serous fluids, the effect will be both quicker and easier. *The Infusion of Senna* is thus quickened and corrected by *Soluble Tartar.* In the same manner various substances included in the class of diuretics, which, although different, still if they be not adverse in their operation, may be conjoined; *Digitalis* and *Potass* are not similar, nor are they incompatible, for while the alkali, through the medium of the circulation, stimulates the secreting organs of the kidneys, the foxglove may, by its sympathetic action, rouse the energy of the absorbents.

B. *By combining Medicines which have entirely different powers, and which are required to obviate different symptoms, or to answer different indications.*

Arrangements constructed upon this principle constitute some of the most valuable remedies with which we are acquainted; they are in general *extemporaneous*, because their very value depends upon their being varied and modified according to the symptoms and circumstances of each particular case. The following general elucidation of the subject may serve to demonstrate the nature and importance of such combinations.

PURGATIVES *with* ANTISPASMODICS. The practice suggested by Drs. Stoll and Warren, in the treatment of *Cholica Pictonum*, affords a striking example of the expediency of combinations of this nature. It is found in that disease, as well as in others attended with spasmodic constriction of the intestinal canal, that purgatives produce no effects unless the spasm be allayed by combining them with *Opium*, (*see Form.* 71, 75, 76,) it is from such a cause that the purgative so popular with tailors and shoemakers, and which consists of *Aloes* with *Sagapenum* or *Galbanum*, affords such prompt relief in the spasmodic colic to which they are subject.

PURGATIVES *with* TONICS. In the exhibition of cathartics, how frequently it occurs in practice that the patient's strength will hardly allow the evacuation; in such a case the addition of *steel* as a roborant, (*Form.* 72, 92, 93) or even of *æther*, or *ammonia*, as a diffusible stimulant, is strongly indicated: the Cheltenham waters offer a natural combination of this character. So again in the cure of dropsy, we have often two indications to fulfil—to evacuate the water, and to support the strength of the patient; hence the necessity of combining brisk and stimulating purges, such as *Scammony*, *Jalap*, *&c.* with active tonics, (83) the *Ferrum Tartarizatum* derives its value from this double mode of operation. In the treatment of amenorrhœa the same medicinal arrangement is not unfrequently indicated.

PURGATIVES *with* MERCURIAL ALTERATIVES. In habitual costiveness, where there appears to be a deficiency of bile, a combination of *Pilula Hydrargyri*, with certain *Aloetic* compounds, may prove serviceable; for while the latter remedy will in the absence of bile supply to the intestines a congenial stimulus, the former will tend to restore the bilious secretion by its influence upon the hepatic system. *See Form.* 79, 81.

DIAPHORETICS *with* TONICS. How frequently is the practitioner desirous of determining to the skin, and at the same time of supporting the strength of the general system: in the progress of a continued fever, we are repeatedly called upon to fulfil such indications. Dr. Bree* also observes, that "in the exhibition of *Diaphoretics* the addition of a bitter infusion or tincture is frequently proper; for the stomach should be gently excited and strengthened during the use of a diaphoretic draught." On the other hand, *Tonics* not unfrequently require the aid of a diaphoretic, for instance, in the cure of *Cynanche maligna*, the use of bark is indicated; but if the skin be hot and dry, it should be accompanied with a diaphoretic. *See Form.* 126.

ANTISPASMODICS *with* TONICS, or NARCOTICS. Under the history of Antispasmodics, (*page* 105) it is stated that there are certain bodies which seem to exert an absolute control over inordinate muscular action, from whatever general cause it may have arisen; in administering such remedies, however, the intelligent practitioner will not overlook the peculiar condition of the system in its relations to the disease; where debility is present, the *Antispasmodic* will be usefully combined with a *Tonic;* and in certain morbid states of the nervous system, with a *Narcotic*.

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* *A Practical Inquiry into Disordered Respiration, p.* 248.

ASTRINGENTS *with* DIAPHORETICS. Dr. Fordyce has observed that combinations of this kind are often indicated in cases of Diarrhœa, where it is necessary to astringe the vessels of the intestines, and at the same time to relax those of the skin; such an indication, he says, may be fulfilled by exhibiting *Tormentil root*, or any other vegetable astringent, with *Ipecacuan*.

ASTRINGENTS *with* NARCOTICS, and ABSORBENTS. It has been already observed, that in a Diarrhœa, depending upon the influx of acrid fluids into the intestines, there are three modes of treatment by which the malady may be obviated, viz. by a narcotic *diminishing the irritability of the intestines;* by an astringent, *restraining the serous excretion;* and by an absorbent, *neutralizing the acrid matter*. As the modes of action are not incompatible with each other, they may be simultaneously established with the greatest advantage. *See Form*. 52.

ASTRINGENTS *with* TONICS. A combination of certain medicines belonging to these two classes is frequently indicated; in the treatment of passive hemorrhage, we have to astringe the bleeding vessels, and to cure the hemorrhagic diathesis, by remedies which are capable of restoring the general tone of the system. In the treatment of the Chronic and humid coughs of old persons, I have very frequently witnessed the beneficial union of the warm and stimulating influence of *Myrrh* with the astringent effects of *Sulphate of Zinc*. *Form*. 69 presents the combination which I have usually adopted with success on such occasions.

TONICS *with* DIFFUSIBLE STIMULANTS. In the cure of dyspepsia, we frequently require a remedy, for the purpose of obviating debility, that is more sudden in its action, and prompt in its effects, than that of a bitter *tonic*, whose operation is almost imperceptible; while the case may at the same time stand in need of that permanent increase of tone, which the latter remedy can alone supply; such an indication therefore must be fulfilled by combination. (*Form*. 40, 42.)

TONICS *with* PURGATIVES. In the exhibition of tonic medicines it is frequently essential to accompany their operation with purgation; in intermittent fevers, for instance, when attended with a redundant secretion of bile, or any obstruction of the viscera, the *bark* must be given in combination with some laxative, for which purpose Boerhaave has recommended *Muriate of Ammonia;* Mead, *Rhubarb;* whilst in many cases, experience suggests the propriety of selecting some of the warmer cathartics, especially the Aloetic; and I shall take this opportunity to observe, that notwithstanding the opinion so strongly expressed by Sydenham, that "*to add any thing to the bark argues either ignorance or craft,*" the most respectable testimony may be adduced to demonstrate the great advantages which have arisen from the various combinations of this heroic remedy. Sir George Baker has said that "*there is less of reason than of severity* [illegible] the above remark of Sydenham; for that it was found in the cure of the intermittent fever which he describes, that, according to circumstances, sometimes the *Virginian snakeroot*, and in other cases *Myrrh*, were added with propriety and advantage; and according to the experience of several practitioners, a drachm of the *rust of iron*, and the same quantity of the powder of *black pepper*, added to each ounce of *bark*, were the means of subduing the most inveterate agues. *Formula* 44 presents a combination, which we learn from Dr. Petrie's letter to Sir George Baker, constitutes a celebrated Dutch remedy for an ague, and which was tried with success in the hospital at Lincoln, in those obstinate intermittents which prevailed in the year 1781.

EXPECTORANTS *with* DIFFUSIBLE STIMULANTS. We have seen that expectorants may be usefully associated with tonics; it sometimes occurs that these remedies require the addition of some diffusible stimulant. In certain states of *peripneumonia notha*, where the powers of life are ebbing, and the lungs become inundated with viscid mucus, I have experienced the value of a combination of some stimulating expectorant and *ammonia*.

ANTACIDS *with* TONICS. In the cure of cardialgia, we have obviously two indications; to neutralize the offending acid by some chemical agent, and to correct the morbid state of the digestive functions by some appropriate remedy. See *Form.* 152. The same observation will apply in the treatment of certain cases of chlorosis, where cardialgia is not unfrequently a very vexatious attendant, and solicits the union of emmenagogues with antacids, or absorbents, as in *Form.* 99.

LITHONTHRYPTICS *with* NARCOTICS. As a palliative in calculous irritation, the union of alkalies and opium proves a valuable resource. (*Form.* 156.) We have also frequently two important indications to fulfil in the treatment of urinary concretions; where the lithic acid diathesis prevails, it will be necessary to neutralize any acidity in the first passages, and at the same time to regulate the functions of the skin; we have moreover to give tone to the digestive organs; so that, in such cases, the art of medicinal combination is well calculated to extend our resources.

In the formation of these compounds we should rarely attempt to fulfil more than two indications, although cases may occur in which it will be eligible to assail the disease with an engine of *triple* powers, as exemplified by *Form.* 52.

In constructing, however, such complex arrangements the practitioner must of course take care that he does not fall into the error of CONTRA-INDICATION, and combine substances which possess properties essentially different, and which are at variance with, or directly opposed to each other; it is an error of the most serious description, and unfortunately is one of too common occurrence in the lower walks of medical practice; "*crimine ab uno disce omnes.*" I lately met with a country practitioner who, upon being asked by a lady whom he attended, the intention of three different draughts which he had sent her, replied, that one would warm, the second cool her, and that the third was calculated to moderate the too violent effects of either; thus it is that discredit and contempt fall upon the use of medicines, which ought only to attach to the ignorant pretenders, or designing knaves who administer them.

Having, in the commencement of this inquiry, stated that all the principles of combination, capable of practical application in the construction of extemporaneous formulæ, are exemplified in the composition of the various productions of Nature, I shall conclude the present section by showing, that *many of our most valuable vegetables owe their useful properties to the joint operation of the several distinct and different ingredients which enter into their composition.* How many substances does Nature produce in the vegetable kingdom, in which the permanent tonic quality of bitterness exerts its influence in union with the transient stimulating powers of an aromatic principle? indeed there is a series of vegetable remedies of this kind: commencing with those that are simply bitter, we gradually proceed through the different species, each blending as we advance an increasing proportion of aroma, until we arrive at those in which the aromatic quality greatly predominates. *Peruvian Bark* may be said to combine within itself the properties of *bitterness, astringency,* and *aroma;* a fact which suggested the probability of our being able to produce an artificial compound that might emulate the effects of *Cinchona,* and to a certain extent the idea appears to have been realized; for we are told by Dr. Cullen that he frequently succeeded in the cure of an intermittent by a combination of *Oak Bark* and *Gentian,* when neither bitters nor astringents, separately, produced the least impression; and I am informed by Dr. Harrison that in the Horncastle Dispensary, of which he was for many years physician, he never employed any other remedy for curing the ague of Lincolnshire than equal parts of *Bistorta* (astringent) and *Calamus Aromaticus* (bitter and aromatic) neither of which plants, *individually*, ever produced the least benefit in such diseases. Dr. Young attempted to produce a compound of this description by adding to the bark of the *Ash* some *Tormentil root* and *Ginger*; and he observes that it acted as an excellent tonic, and that according to the experiments of his friends it seemed to cure quartan agues. In the aromatic barks and woods, such as those of the *Canella*, *Orange-peel*, *Sassafras*, &c. the aromatic principle* is combined with a bitter ingredient; a union which proves of singular service in the formidable bowel complaints so common in tropical climates.

The great superiority of the hop, as an ingredient in our malt liquors, depends upon the fact of its containing within itself several distinct and independent elements of activity, which the other bitter herbs that have at different times been employed as its substitute, do not possess. The philosophy of its operation may be adduced as a striking illustration of the present subject; first then, it contains a *bitter* principle, which imparts to the beverage a tonic quality and an agreeable flavour; while at the same time an *aromatic* ingredient adds a warm and stimulant property, and modifies the bitterness; the hop, moreover, contains an *astringent* ingredient (*Tannin* and *Gallic Acid*,) the effects of which are to precipitate the vegetable mucilage, and thus to remove from the beer the active principle of its fermentation; every attempt therefore to substitute an ordinary bitter for that of the hop must necessarily fail, unless a compound can be so artfully constructed as to contain in due proportions, the principles of bitterness, astringency, and aroma. *Quassia* must therefore necessarily prove but a sorry substitute; it will impart bitterness enough, but it will not be modified by agreeable aroma; and as it contains no astringent principle, it will fail in precipitating the vegetable mucilage, or gluten; in consequence of which the beer so manufactured will be in a perpetual state of fermentation, until it is entirely spoiled.† *Rhubarb* is another medicinal plant which may be brought forward in elucidation of the analogies subsisting between natural and artificial combinations; in this case nature has presented us with a singular and most important union of medicinal powers,—that of an astringent, with a cathartic property! virtues, which we might, without the light of experience, have pronounced to be incompatible with each other; and yet we find that in this instance the property of astringency never interferes with, or opposes the purgative force, since the former does not display itself unless the substance be administered in small doses; or, when given in larger ones, not until it has ceased to operate as a cathartic.

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* The vegetable kingdom presents us with many natural compounds of this kind; several of which might be pressed into the service of medicine with much advantage. With respect to the number and variety of such substances, our Pharmacopœia contains but a meagre bill of fare.

† The same reasoning will explain why *English* hops, that contain more *Gallic Acid* and *Tannin* than those imported from the Continent, are found to be superior as preservatives of beer.

IV.

TO OBTAIN A NEW AND ACTIVE REMEDY NOT AFFORDED BY ANY SINGLE SUBSTANCE.

A. *By combining medicines which excite different actions in the Stomach and System, in consequence of which* NEW *or modified results, are produced.*

This constitutes by far the most obscure part of the subject of medicinal combination, and must ever continue so until we become better acquainted with the laws which govern the action of medicinal substances upon the living system. That the most valuable effects, however, are really produced by such arrangements, we have the testimony of long experience, and examples are furnished in the valuable and well-known operation of many officinal preparations; thus the "*Pulvis Ipecacuanhæ compositus*" contains as its active elements, *Opium* and *Ipecacuanha;* and yet, in well-regulated doses, it neither possesses the narcotic operation of the former, nor the nauseating effects of the latter; they appear to be mutually lost, and converted into a powerful diaphoretic: so again, the emetic operation of *Sulphuret of Antimony*, and the specific influence of *Calomel*, are changed by combination with each other, giving rise to a remedy eminently distinguished for its powers as an alterative. Dr. Bree observes, that *Tincture of Squills* combined with *Extract of Henbane*, and the *Nitric Acid*, have been proved by much experience to be expectorant and sedative in a paroxysm of asthma, although each article, uncombined, had been given without success. See *Form.* 139.

It is probable that many of our natural remedies owe their efficacy to the results of a similar species of combination. In the former edition of this work it was stated that, according to the assertion of Dr. Chapman, "*Kino*, when administered in union with *Calumba*, constituted a pretty certain, and powerful purgative;" since the publication of this fact, I have investigated what, if true, would appear to be a most extraordinary anomaly in the philosophy of medicinal combination, and I find that the statement of Dr. Chapman* is not borne out by experiment. That we might arrive at a just conclusion upon this subject, I requested the assistance of my friend Dr. John Davy, whose character for experimental accuracy, and whose situation as Superintendent of the Medical Division of the General Military Hospital at Chatham, seemed to point him out as a person peculiarly adapted for such an inquiry; the result of his trials does not establish that of the experiments of Dr. Chapman, but on the contrary it seems to prove, that neither *Kino* nor *Calumba*, when taken separately, has a constipating effect, and that in the form of powder, (especially the *Calumba*) each has an aperient quality, which is not increased by exhibiting the two medicines together in a state of mixture. The trials from which these inferences are drawn were made on different individuals in tolerable health, and they were repeated more than once; in some cases they were given separately, and in others, mixed together, in doses varying from a scruple to a drachm of each.

B. *By combining Substances which have the property of acting chemically upon each other; the result of which is the formation of* NEW COMPOUNDS, *or the decomposition of the original Ingredients, and the developement of their more* ACTIVE ELEMENTS.

a. *Formation of New Compounds.*

It is not necessary to extend our researches beyond the range of the Pharmacopœiæ, to collect a variety of interesting and important examples, in illustration of this division of our subject; if we require a striking example of the agency of chemical combination in destroying the identity of the original constituents, and of giving origin to a compound of new powers, it may be exemplified by the well-known instance of *Sulphate of Potass*, a substance possessing but a weak affinity for water, and exerting but little energy upon the animal economy; whereas the two ingredients of which it consists are distinguished for the extreme eagerness with which they unite with water, and for the caustic activity which they display in their action upon animal matter.

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* Therapeutics, vol. 2, p. 470.

Under this head the class of metals will also present itself to our consideration, all the individuals of which, with the exception perhaps of iron, are perfectly inert and harmless; even arsenic, lead, copper, and mercury, which in certain states of combination constitute some of the most virulent of known substances, exert no action upon the living system, unless they be in union with some other body; but when so united, how valuable do they become, and what various medicinal effects may they not be made to produce?

The *Acetic Acid* and *Ammonia* become neutralized by combination with each other, affording a compound of new virtues. *Sulphate of Zinc*, and *Super-acetate of Lead*, when mixed together in solution, decompose each other, and the *Acetate of Zinc* which is formed, affords a more valuable remedy than either of the former salts, as an application in ophthalmia. The "*Mistura Ferri Composita*" of our Pharmacopœia offers another example of the same chemical resource. I also beg the reader to refer to the construction of *Formula* 82, which presents an instance of a purgative draught being produced by combination, in which the original properties of every element are entirely changed. See also *Formula* 87, the chemical actions of which are more complicated, but no less instructive than the preceding one; the ingredients of the formula are the *Carbonates of Soda* and *Magnesia*,—*Sulphate of Iron*,—*Diluted Sulphuric Acid*, and *Water*—and when mixed together, the following decompositions would appear to take place; the free *Sulphuric acid*, together with that which exists in the *Sulphate of Iron*, being just sufficient to decompose the *Carbonates of Soda* and *Magnesia*, forms two neutral *Sulphates*, (viz. *Sulphates of Soda* and *Magnesia*,) and thereby disengages a volume of *Carbonic acid gas*, which not only increases the purgative operation of the new saline compounds, but by its excess holds in solution the *Carbonate of Iron*, which is formed by the decomposition of the *Sulphate*, and which in that state displays an effect powerfully tonic.

Before we quit the consideration of medicinal compounds as the results of chemical action, it is expedient to remind the practitioner of the essential difference between *Mixture* and *Combination*, a difference which affects the medicinal virtues no less than the chemical characters of bodies; it is determined by ample experience, that substances will produce effects upon the living system when presented in a state of simple mechanical mixture, very different from those which the same medicines will occasion when they are combined by the agency of chemical affinity, as is well exemplified in the comparative effects of alcohol as existing in ardent spirits, and in wine (see *Vinum*;) or in the relative powers of *Mercury* in the *Unguen-*

tum Hydrargyri of the London College, and the *Unguentum Oxidi Hydrargyri cinerei* of the Pharmacopœia of Edinburgh, (see *Unguent. Hydrargyri;*) the former of which is a true chemical compound, whereas the latter is a simple mixture of its ingredients.

b. *Developement of Active Elements.*

The accomplishment of such an effect is in many instances the sole object of a pharmaceutical process. The resinous body known by the name of *Gum Benzoin*, is thus submitted to a chemical process of decomposition, in order to develope its *Benzoic Acid;* and upon the same principles, the *Muriatic* and *Nitric* acids are elicited from the saline compounds in which they exist; *Ammonia*, in its pungent form, is developed from its inodorous *Muriate;* and the fixed alkalies are obtained in their caustic state, from the comparatively mild *carbonates* in which they naturally exist. But a more striking and instructive instance of the effect of chemical action, in developing an active, or useful principle, cannot perhaps be selected than that of the well-known stimulant Plaster, composed of *Muriate of Ammonia*, *Soap*, and *Lead Plaster*, in which the alkali of the soap enters into combination with the muriatic acid when the *Ammonia*, upon which the virtues of the plaster solely depend, is slowly disengaged in the form of gas, producing a powerful rubefacient and stimulant effect: the "*Cataplasma Fermenti*," or "*Yeast Poultice*" is indebted for its antiseptic properties to a similar agency, for they do not depend upon any virtue in the ingredients themselves, but upon their decomposition, and the consequent developement of an active element, which is *Carbonic Acid*. The practitioner unacquainted with the *modus operandi* of these combinations, would inevitably fall into an error by which their efficacy must be lost; he would hardly apply them as soon as they were formed, nor would he be aware of the necessity of repeating them at short intervals.

The decomposition of *Calomel* by lime water, forming the well-known "*black wash*," and that of *corrosive sublimate* in the same fluid, constituting the "*aqua phagedenica*," furnish remedies which derive all their peculiar efficacy from the developement of the mercury in different states of oxidation.

A substance separated by chemical precipitation is often a valuable remedy, being in a much more subtile and impalpable form than any body can be rendered by mechanical triture and levigation; for example, the *Carbonate of Lead*, (Cerussa,) when diffused in water, is, according to the experience of our best surgeons, far less active as a topical application than the same substance when produced at once by precipitation from the *Sub-acetate* of that metal.

Many interesting and important illustrations may possibly be hereafter derived from an extended knowledge of vegetable chemistry; recent analysis has already developed principles of extreme activity from several of our most esteemed plants; thus have Sertuerner and Robiquet, succeeded in separating a narcotic element from *Opium* (*Morphia*;) Majendie, and *Pelletier*, an emetic principle from *Ipecacuan*, (*Emetin*;) and the last-mentioned chemist, together with Caventou, a tonic one from *Peruvian Bark*, (*Cinchonine*,) the properties and application of which will be fully explained under the history of the different substances which contain them.

It is only here necessary to caution the practitioner against those fallacies into which the captivating theories of the chemist may seduce him; hitherto, no practical advantage has arisen from the above discoveries; and if the views which I have offered upon the subject of combination be correct, it will follow as a corollary, that the concentration *of an active element must in many cases abridge its powers as a remedy*; for although the matter thus removed may *individually* be quite inert, yet in combination, it may subdivide the particles of the essential constituent, or modify its solubility, and give impulse and steadiness to its operation.

C. *By combining substances, between which no other chemical change is induced, than a diminution, or an increase, in the* SOLUBILITIES *of the principles, which are the repositories of their medicinal virtues.*

The degree of solubility possessed by a medicinal substance, may perhaps be regarded by some practitioners as a circumstance of but little or no importance; it will however appear in many cases that *it not only influences the activity of a remedy, but, like its dose, goes far to determine its specific operation.* It is probably owing to the diversity which exists in the solubility of the active elements of certain purgatives, that so great a diversity occurs in their operation; it is for instance easy to conceive that a medicine may act more immediately and specially on the stomach, small, or large intestines, according to the relative facility with which its principles of activity enter into solution; that those which are dissolved before they pass the pylorus are quick and violent in their effects, and liable to affect the stomach, as is exemplified by the action of *Gamboge*, &c. whilst some resinous purgatives, on the other hand, as they contain principles less soluble, seldom act until they have passed out of the stomach, and often not until they have reached the colon. *Colocynth* has a wider range of operation, since its principles of activity reside both in soluble and in insoluble elements. *Aloes* again, being still further insoluble, pass through the whole alimentary canal, before they are sufficiently dissolved, and act therefore more particularly upon the rectum, by which they are liable to produce piles, tenesmus, and the various effects which so usually attend their operation. The characteristic effects of *Rhubarb*, *Senna*, *Saline Cathartics*, and indeed of all individual substances which compose the class of the purgative medicines, will also admit of a satisfactory explanation from the application of these views. It ought, moreover, to enable the practitioner, by changing the solubilities of these substances, to change their medicinal effects. Experience shows that this is the fact, and that it may be effected either *by the intervention of substances that act* CHEMICALLY; or *by the addition of Ingredients whose operation is entirely* MECHANICAL; thus by combining *Aloes* with *Soap*, or an *Alkaline Salt*, we quicken their operation, and remove their tendency to irritate the rectum; the *Compound Decoction of Aloes* affords a combination of this kind. *Gamboge*, whose too ready solubility it is an object to obviate, should be intimately incorporated with some insoluble purgative, as for instance *Aloes;* a formula of this nature was introduced by Dr. George Fordyce, and it has been since simplified, and admitted into our pharmacopœia, under the title of "*Pilulæ Cambogiæ Compositæ.*" *Tartrate of Potash*, which on account of its comparative solubility has gained the name of *Soluble Tartar*, acts with correspondiug briskness upon the small intestines; but if we increase its proportion of *Tartaric Acid*, we convert it into a *super-tartrate* or "*Cream of Tartar*," which is a substance characterized by a comparative degree of insolubility, a correspondent change is produced in the medicinal activity of the salt; its purgative effects are considerably diminished, whilst its diuretic powers are rendered more considerable; we may even extend this experiment by adding to the *Cream of Tartar*, *Boracic Acid*, a substance capable of increasing to a certain extent its solubility, when we shall again find that its purgative properties are strengthened in an equal proportion.

It has been observed that a mixture of different saline cathartics is more efficient than an equivalent dose of any single one, a fact which is strikingly exemplified in the prompt and active operation of Cheltenham Salts, in comparatively small doses, as well as in that of sea water. I submit whether this may not in some degree depend upon increased solubility; for it is a law well known to the chemist, that *when water has ceased to act upon a salt, in consequence of its having obtained the term of saturation, the solution may still take up another salt of a different kind.* I apprehend that an advantageous application of this law might be frequently made in practice, and the energies of a remedy thereby considerably extended.*

Where the active principle of a cathartic is not sufficiently soluble, it is apt to vex and irritate the bowels, producing tormina, instead of exciting a free and copious excretion; hence the reason why the operation of resinous purgatives is so commonly attended with griping, and why relief may be obtained by combining them with *neutral salts*. Thus also *Senna*, whose virtues reside in extractive matter, is apt, by decoction or long exposure to the air, to act with griping, in consequence of the extractive matter becoming by oxidation resinous, and comparatively insoluble: this effect is best counteracted by the addition of *soluble Tartar*, that will quicken its action, or an alkaline salt that will increase its solubility.

It appears then to be established as a pharmaceutical maxim, that *the intensity and even specific action of a purgative medicine may be modified or completely changed, by changing the degree of solubility possessed by the principles in which its activity resides.*

The application of this principle is highly important in practice, directing us in the choice of the different purgatives, according to the objects which we may wish to fulfil by them, and pointing out safe and easy methods by which we may increase, diminish, retard, or accelerate their operation; it thus enables us to construct new and powerful combinations, by imparting to established remedies fresh activity, or by mitigating the acrimony and violence of arrangements in other respects efficacious and eligible.

In the exhibition of solid substances, their mechanical state of division may be capable of modifying their operation, from the influence which this condition must necessarily exert upon their solubilities, although I am by no means disposed to assign to it the importance which Gaubius has ventured to express, "*Sunt quæ ruditer pulverata alvum, subtilius vero urinas, aut alios humores movent;*" and Ray, speaking of the *Asarum*, (Hist. p. 208) has the following remark—"*Quo tenuius est*

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* An ingenious application of this law has been made for the purpose of purifying *Epsom Salts*. See *Magnesiæ Sulphas*.

tritum, eo magis urinas movere, minus autem alvum ducere creditur;" and Linnæus* observes that this same plant, when exhibited in the state of *very fine* powder, uniformly acts as an emetic, but that when *coarsely* powdered, it always passes the stomach, and becomes cathartic. *M. Virey* has made a similar observation with respect to Hellebore, "*L'Hellebore pulverisé fait vomiter; concassé il purge; et en decoction prolongée, il en devient sudorifique ou diuretique.*" I have endeavoured under the article *Pulveres* to establish some useful precepts upon this subject, to which I beg to refer the reader.

The influence of solubility upon the medicinal energies and specific effect of remedies, may be farther illustrated by a comparative examination of the virtues of the *Acetate* (superacetate) and *Sub-acetate* (Goulard's Extract) *of Lead:* the acetate preserves its solubility and integrity under any degree of dilution, while the sub-acetate when slightly diluted with the purest water, in consequence of the carbonic acid diffused through it, gives out a copious precipitate; the former, therefore, is undoubtedly the more immediately active application as a preparation of lead, but it is nevertheless perhaps less adapted to remove inflammation and abate irritation than the turbid mixture of the sub-acetate, since the slow and gradual action which is ensured by the latter is more desirable than the instantaneous operation of the same remedy, applied in a more soluble form; the popular injection for gonorrhœa, consisting of a mixed solution of *Sulphate of zinc* and *Super-acetate of lead*, probably owes much of its value to the insoluble precipitate of *Sulphate* of lead which necessarily takes place, and which, from becoming entangled in the mucus of the urethra, produces a more permanent stimulus than what could have happened from a soluble salt: (*Form.* 62) thus again the *Sulphuret of Antimony*, and some other preparations of that metal, of slow solubility, establish a more permanent influence than *Tartarized Antimony*, and may be preferable to it in cases where immediate and active evacuations are not required.

Of remedies composed of vegetable tonics, the useful application of this principle is also apparent. Thus the addition of *alkalies*, or *lime water* to the infusions of *Gentian*, &c., or to the decoctions of *Bark*, by rendering their extractive and resinous principles more soluble, increase their elegance, and exalt their virtues. (*Formulæ* 39, 41,) although this law admits of an important exception to be hereafter explained. A knowledge of this principle likewise offers many useful hints connected with the successful exhibition of active remedies; it points out the medicines which require dilution in order to promote their operation, and those whose too speedy and violent effects may be retarded and checked by an abstinence from all potation. Thus in the exhibition of *Diuretics* likely to become cathartic or diaphoretic, no liquid should be given for at least an hour after their administration; the same caution applies with respect to the *Compound Powder of Ipecacuan*, which has a strong tendency to excite vomiting. When the remedy has passed out of the stomach, then the ingestion of fluids may, and ought to be encouraged.

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* *Amœnitates Academ;* T. 7, p. 307.

To Sir Francis Milman the Profession is highly indebted for hints concerning the importance of accompanying the exhibition of *Diuretics* with plentiful dilution,* the arguments he adduces elucidate in a very satisfactory manner the view which has been just taken of the INFLUENCE OF SOLUBILITY.

The influence of solubility,† in increasing the virulence of a poisonous substance, has already been illustrated very fully (*page* 166.) and it has also been shown under what circumstance it may be admissible. When these active substances are administered as remedies, in small doses, the precept respecting their solubility is even more important, for in such cases the smallness of the quantity places their operation more immediately under the control of various incidental agents; *destroy* the solubility of a medicine, and you will probably divest it of those properties which render it useful. *Nitrate of Silver*, by coming in contact with a *Muriatic Salt*, is rendered quite inert, and may be discovered unaltered in the fæces of persons to whom it has been administered. See *Argenti Nitras.*

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* See also a paper in the MEDICAL TRANSACTIONS, vol. 2, entitled "*Several extraordinary instances of the cure of Dropsy,*" *by* GEORGE BAKER, M.D. Read September 9, 1771.

† The most subtile of all poisons,—*the matter of febrile contagion,*—is certainly modified in activity by the degree of moisture in the atmosphere influencing its solubility; the Plague is said to be most common in Egypt after the inundation of the Nile, a period at which the atmosphere is necessarily saturated with water; according to the account of Sir Robert Wilson, the English and Turkish armies that marched to Cairo escaped contagion, while the troops that remained stationary on the moist shore of Aboukir, were very severely visited. On the other hand, the *Harmattan*, a wind experienced on the western coast of Africa, between the Equator and fifteen degrees *North Latitude*, blowing from northeast towards the Atlantic, and which, in consequence of its passage over a very extensive space of arid land, is necessarily characterized by excessive dryness, puts an end to all Epidemics, as the Smallpox; and infection at such a time does not appear to be easily communicable even by art. *Philosophical Transactions, Vol.* 21.

The difficulty of communicating infection to animals during a dry state of the air, as remarked on the Western Coasts of Africa, during the blowing of the *Harmattan*, agrees with some observations on Plague by the French Physicians, as this complaint first made its appearance in the French army during a moist state of the air in Syria, when it lay under the walls of Jaffa in February, 1800.

It is a well known fact that volatile bodies are sooner converted into a gaseous state by the presence of water in the atmosphere; this is strikingly exemplified by the greater rapidity with which *Limestone* is burnt and reduced to quick-lime, in moist weather, and by the assistance which is rendered in a dry season, by placing a pan of water in the ash-pit; so again the perfume of flowers is most sensible when the air is humid, as during the fall of the evening dew, or in the morning when the dew evaporates, and is dissipated by the rays of the rising sun; for the same reason the stench of putrid ditches and common sewers, is conveyed to the organs of smell much more speedily in summer previous to rain, when the air is charged with moisture.

Under the article *Plumbi Superacetas* the practitioner will also find that the conjunction of this substance with any sulphuric salt, at once deprives it of its valuable properties as a remedy in *Hæmopthysis.*

I shall conclude this section upon the influence of Solubility, by the relation of an anecdote which may tend to confirm the justness of the views I have offered, more satisfactorily perhaps than any additional arguments derived from a scientific examination of chemical and medicinal facts; inasmuch as it presents us with a practice, the utility of which has been discovered by unassisted experience, and must consequently be independent of theory. The American Indians, whenever they undertake a long journey, and are likely to be destitute of provisions, employ Tobacco for the purpose of counteracting the uneasy sensations of hunger, and in its preparation for such a purpose they adopt an expedient for modifying its powers, and protracting its effects, which affords an instructive illustration of the influence of solubility; it consists in combining the juice of tobacco, with the pulverized shells of snails, cockles, and oysters;* the mass is dried, and formed into pills, of a convenient size to be held between the gum and lip, which being gradually dissolved and swallowed, fulfil the intention required.

V.

TO AFFORD A CONVENIENT, AGREEABLE, AND EFFICACIOUS FORM.

After the views which have been submitted, it is evident that the form in which a remedy is exhibited may exert some influence upon its medicinal effects; in general it must be adapted to the extent of the dose—the nature of the remedy—its degree of solubility—the objects it is to fulfil—and, as far as can be attained with propriety, to the caprice of the patient. For more particular directions, see *Decocta Infusa*, *Tincturæ*, *Misturæ*, *Pilulæ*, *Pulveres*, &c.

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* They are previously calcined but not burnt to lime, to an extent only that may destroy their tenacity, and render them fit for levigation.

When a substance, or a combination of substances, requires the addition of some other one for the purpose of imparting a convenient, agreeable, or efficacious form, *a vehicle should always be selected, whose effects will be likely to correspond with the intention of the other ingredients.* This precept may be exemplified by a reference to *Formulæ* 80, 134, and others, the key letters of which will show the *modus operandi* of their respective *vehicles*.

It is sometimes necessary to add an ingredient for the purpose of preventing the spontaneous decomposition of a medicine, thus is the compound tincture of cardamoms added to the *Decoct. Aloes comp.* in order that it may be longer kept without change.

Some medicines are more grateful to the stomach, as well as more efficacious in their operation, when exhibited in a state of effervescence; we must however be careful that their properties are not injured by such a combination; see *Formulæ* 82, 86, 27.

Such are the objects which are to be attained by combining several substances in one *Formula*, and such are the laws by which these compositions are to be regulated; but unless a physician can satisfactorily trace the operation of each element in his prescription to the accomplishment of one or more of the objects which I have enumerated, SIMPLICITY should be regarded by him as the greatest desideratum. I was once told by a practitioner in the country, that the quantity, or rather complexity of the medicines which he gave his patients, for there never was any deficiency in the former, was always increased in a ratio with the obscurity of their cases; "if," said he, "I fire a great profusion of shot, it is very extraordinary if some do not hit the mark." Sir Gilbert Blane* has given us a similar anecdote; "a practitioner being asked by his patient why he put so many ingredients into his prescription, is said to have answered more facetiously than philosophically, "*in order that the disease may take which it likes best.*" A patient in the hands of such a practitioner has not a much better chance than the Chinese Mandarin who, upon upon being attacked with any disorder, calls in twelve or more physicians, and swallows in one mixture all the potions which each separately prescribes!

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* Medical Logic, edit. 2, p. 192, *note*.

Let not the young practitioner however be so deceived; he should remember that unless he be well acquainted with the mutual actions which bodies exert upon each other, and upon the living system, it may be laid down as an axiom, that *in proportion as he complicates a medicine, he does but multiply the chances of its failure.* SUPERFLUA NUNQUAM NON NOCENT: let him cherish this maxim in his remembrance, and in forming compounds, always discard from them every element which has not its mode of action clearly defined, and as thoroughly understood.

The perfection of a Medicinal Prescription may be defined by three words; it should be PRECISE (in its *directions*) CONCISE (in its *construction*,) DECISIVE (in its *operation*.) It should carry upon its very face an air of energy and decision, and speak intelligibly the indications which it is to fulfil. It may be laid down as a position which is not in much danger of being controverted, that *where the intention of a medicinal compound is obscure, its operation will be imbecile.*

A Medicinal Formula has been divided into four constituent parts, a division which will be found to admit of useful application to practice, inasmuch as it was evidently suggested with a view of accomplishing the more prominent objects which have been related in the preceding pages; or in the language of Asclepiades, of enabling the BASIS to operate "CITO," "TUTO," et "JUCUNDE." Quickly, Safely, and Pleasantly. thus

I. THE BASIS, or Principal Medicine.
(*curare.*)

II. THE ADJUVANS; that which assists and promotes its operation.
("*Cito.*")

III. THE CORRIGENS; that which corrects its operation.
("*Tuto.*")

IV. THE CONSTITUENS; that which imparts an agreeable form.
("*Jucunde.*")

These elements however are not all necessarily present in every scientific formula, for many medicines do not require any addition to promote their operation, and the mild and tractable nature of others renders the addition of any corrective unnecessary; whilst many again are in themselves sufficiently manageable, and do not therefore require the *intermede* of any *vehicle* or *constituent*. It also frequently occurs that one element is capable of fulfilling two or more of the objects required; the ADJUVANS for instance, may at the same time act as the CORRIGENS, or CONSTITUENS; thus the addition of *Soap* to *Aloes* or *Extract of Jalap* mitigates their acrimony, and at the same time quickens their operation (80.) So again *Neutral Salts* both quicken and correct the griping which attends the operation of resinous purgatives. The disposition of the key letters placed opposite to the elements of the following *Formulæ*, will furnish the practitioner with a farther elucidation of these principles, viz. 70, 71, 76, 77, 101, 102, 105, 135, &c. This coincidence, if possible, should be always attained, for it simplifies the formula, and by decreasing the bulk of the remedy, renders it less nauseous and more elegant.*

This division also affords the best general rule for placing the ingredients of a formula in proper order, for the order should correspond with that of the arrangement; and those elements intended to act in unity should be marshalled together. The chemical and mechanical nature, however, of a medicinal substance will occasionally offer exceptions to any general rule; thus the volatile ingredients should be those last added, and the constituent or *vehicle* should be placed next the particular element to which it is intended to impart convenience or efficacy of form, or a capability of mixing with the other ingredients, as may be seen in Formulæ 69, 71, 127, 136, &c. If any substance require decoction or infusion, a question then arises, determinable only by a knowledge of its chemical composition, whether the remaining ingredients should be added previous to, during, or subsequent to that operation; *Formula* 40, which is recommended by Pringle as a remedy in Typhus fever, may serve to exemplify this principle. The preparation of the ingredients is resolved into three distinct stages, and it is easy to discover that by any other arrangement their several virtues could not be fully obtained, and secured from change. The *Cinchona*, for instance, yields its full powers only by decoction, a process which would necessarily impair those of *Serpentaria*, connected as they are with an essential oil; whilst the addition of the acid at any other stage of the process than that directed, would produce decompositions in the vegetable substances; and it is evident that were the *Spirit of Cinnamon* added previously, it would be entirely lost by vaporization. So in making the *Compound Decoction of Sarsaparilla*, the *Sassafras* should be added after the other ingredients have undergone boiling.

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* It appears from what has been stated under Section I. B. with respect to DIURETICS, that some medicines not only *assist*, but actually DIRECT the operation of the substances with which they may be associated, and that many remedies act in unison with those they are joined with; thus *Nitre* in conjunction with *Squill* is diuretic; in conjunction with *Guaiacum*, diaphoretic; for these reasons I hesitated whether I ought not to have added a fifth *constituent*, and restored the "*Dirigens*" of ancient authors.

Compound Medicines have been divided into two Classes, *viz.*

I. Officinal Preparations,

which are those ordered in the Pharmacopœias, and kept ready prepared in the shops. No uniform class of medicines, however, can answer the indications of every case, and hence the necessity of

II. Magistral or Extemporaneous Formulæ.

These are constructed by the practitioner at the moment, and may be either arrangements altogether new, or officinal preparations with additions, or modifications. Too much importance cannot be assigned to the Art which thus enables the physician to adapt and graduate a powerful remedy to each particular case by a prompt and accurate prescription; without this knowledge, the practitioner of the nineteenth century, with all the collateral aid of modern science, will be as helpless in the chamber of sickness as the physicians of ancient Egypt, who were obliged by the laws to follow, with servile exactness, the unvarying mandates of their medical code. *Extemporaneous* are also preferable to *Officinal Formulæ*, whenever the powers of the compound are liable to deterioration from being kept; for examples, see *Mistura Ferri composita; Infusum Sennæ, Liquor Hydrargyri Oxy-muriatis*, &c.

The Chemical and Pharmaceutical Errors, which may be committed in the composition of Extemporaneous Formulæ, are referrible to the following Sources.

I.—*Substances are added together which are incapable of mixing, or, of forming Compounds of uniform and suitable consistence.*

This may be termed an error in the *Mechanism* of the Prescription, and has been generally regarded as being more inconvenient than dangerous, more fatal to the credit of the Prescriber than to the case of the Patient; the observations however which are offered in this work, especially under the article *Pilulæ*, must satisfy the practitioner that this error is more mischievous in its effects than has been usually supposed; it is so palpable and self-evident in its nature, that it will be unnecessary to illustrate it by more than one or two examples. *Calomel*, for instance, has been ordered in an aqueous vehicle, and certain *resinous tinctures* have been directed in draughts, without the necessary intervention of mucilage: so again, an intermixture of substances has been formally ordered in powder that possess the perverse property of becoming liquid by triture (see *Pulveres*,) and bodies have been prescribed in the form of pills, whose consistence* renders it impossible that they should preserve the globular form; or else they have been so hard and insoluble, that they might be fired through a deal board.†

II.—*Substances are added together which mutually decompose each other, whence their original virtues are changed, or destroyed.*

This is a more serious, but not a less frequent source of error; it has been already shown in this Analysis (IV. B) that the judicious and scientific application of chemical science has furnished new and endless resources to the physician, by exalting the efficacy and correcting the acrimony of established remedies, or by combining inert substances so as to create new and powerful medicines. With equal truth and confidence it may be asserted, that the abuse of these means not only destroys the virtues of the most valuable articles in the *Materia Medica*, but that the mildest remedy may be thus converted into an instrument of torture, and even of death. In a lecture delivered at Apothecaries' Hall, Mr. Brande stated that he had seen a prescription in which the *blue*, or mercurial pill, was ordered in conjunction with nitric acid, and that the patient was brought to "death's door" from the formation of *nitrate of mercury* in his stomach! I have myself lately seen a *Recipe*, professing to afford a preparation similar to the "*Black Drop*," and which directed a mixture of a *Tincture of Opium*, made with rectified spirit, with *Nitric Acid*; in this case, it may be very safely inferred that the author was not only ignorant of the chemical habitudes of these bodies, but that he never performed the experiment in question, or he would have learnt from dire experience, that in consequence of the rapid evolution of *nitric ether*, the contents of the phial will explode with violence, to the imminent hazard of the operator's eyesight. During the course of my professional practice I have witnessed more than an ordinary share of consumptive cases, and I can confidently state that in the treatment of Hæmopthysis, the styptic properties of *super-acetate of lead* are entirely invalidated by combination with *Alum*, or by its exhibition being accompanied with that of the acidulated *infusion of roses*, or with small doses of *sulphate of magnesia*; and yet, I would ask, whether this practice is not usual and general? The practitioner, however, cannot be too often reminded that he is not to reject a remedy whose value has been ascertained by experience, merely because it appears to be unchemical: the popular and certainly useful pill, consisting of calomel, rhubarb, and soap, may be adduced as an example of this kind. Of the *Mistura Ferri Composita*, I will only say that it is a most valuable combination; and whether it be the product of accident, or the result of philosophical induction, it equally deserves a distinguished place in our list of tonic remedies; but it cannot be denied that many of our esteemed arrangements, which are in apparent contradiction to all the laws of composition, owe their efficacy to the operation of affinities altogether blind and fortuitous.

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* Dr. Percival in his Essays, ingenuously exemplifies this error by stating a case which occurred in his own practice. "I ordered," says he, "a combination of *Camphor* and *Balsam of Copaiba* in the form of pills, but the apothecary informed me that he was unable to form them into a mass, since they liquefied like treacle." I may here observe that the addition of a small portion of the coagulated yolk of an egg, would have rendered the mixture practicable.

† This would occur, if in making the *Pilulæ Ferri Compositæ*, we were to substitute the *Liquor Potassæ* for the *Sodæ-Sub-carbonas*.

It has been observed that the practice of combining certain vegetable tonics with lime water, although very common, is in cases where we are desirous to obtain their *astringent* effects, of very doubtful propriety; for the fact is, that *Tannin* forms with the alkalies and alkaline earths, compounds that are not soluble in water,* and which are therefore probably inefficacious. It may perhaps be said that such an argument cannot avail, because if the astringent matter be even introduced into the stomach in its purest form, it will immediately form an insoluble compound on its contact with *gelatine*.† We know so little of the laws of *gastric chemistry*, that it is difficult to learn what changes take place in the animal laboratory, (*See p.* 79,) but it would seem probable that the powers of the stomach rather consist in decomposing the ingesta into simpler forms, than in complicating them by favouring new combinations; besides which, if such a compound were formed, it would be subsequently decomposed *in transitu*; for the experiments of Sir H. Davy show that vegetable astringent matter passes through the body unchanged. (*page* 110.)

It is impossible to furnish any general rule that may enable the practitioner to avoid mixing together substances which are incompatible with each other; a knowledge of their chemical habitudes must in every case direct him, and these are enumerated in the second part of this work, under the history of each medicinal substance. The physician, however, will find it useful to retain in his remembrance the simple and beautiful law which has been so ably developed by the eminent author of the "STATIQUE CHIMIQUE," that *whenever two salts in a state of solution are brought together, which contain, within themselves, elements capable of producing a soluble and insoluble salt, a decomposition must necessarily arise*;‡ he illustrates this law by the example of *Nitrate of Silver*, and *Muriate of Potass*, whose elements are capable of forming within themselves a soluble salt, *Nitrate of Potass*, and an insoluble salt, *Muriate of Silver*. It deserves also to be remembered, that a table of chemical affinity will not upon all occasions prove to the medical practitioner an unerring pilot; in those cases, for instance, where a *super or sub Salt is readily formed, a sub-*

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* This fact has been very satisfactorily proved by the failure of the practical attempts which were made by *Dr. Macbride* of Dublin, to improve the art of tanning leather by the use of *Lime-water*, instead of plain water, which he conceived would extract the virtues of *Oak Bark* more completely. The reader who is desirous of a more detailed account of this plan must refer to *Phil. Trans.* Vol. lxxiii. Part 1, Art 8.

† We trust these observations will not create any alarm in the Citizen; he may very safely continue the laudable practice of regaling himself and friends with a cup of strong tea, in spite of the Turtle soup they may have taken, and that too without the least danger of converting their stomachs into tanneries, or their food into leather.

‡ For a highly ingenious, and important extension of these views, see *Aqua Marina*. (Note.)

stance less weakly attracted by another than a third, will sometimes precipitate this third from its combination with the second, thus, in the production of *Nitric acid*, we decompose the *Nitrate of Potass*, by virtue of the superior affinity of the *Sulphuric acid* for its base, the nitric acid is accordingly disengaged, and a *Sulphate of Potass* remains in the retort; now, paradoxical as it may appear, if nitric acid be poured upon the *Sulphate of Potass*, a quantity of nitre will be reproduced, in consequence of the saturation of a portion of the base, in such a proportion as to enable the remaining atoms to form a *Bisulphate of Potass*. In the same manner the *Tartrate of Potass* (Soluble Tartar,) is, contrary to the usual affinities, decomposed by all *sub-acid vegetables*, which neutralize a portion of the base, and convert it into the *Bi-tartrate of Potass*, (*Cream of Tartar*,) the same effect is even produced by *Carbonic acid*.*

There are besides certain cases wherein *Triple Salts* are produced, which afford apparent exceptions to the usual affinities of the bodies involved in the combination; we have a very good illustration of this truth in the decomposition of the *Liquor Ammoniæ Acetatis* by *Magnesia;* if the practitioner refers to a table of affinities, he will perceive that *Acetic acid* has a greater attraction for *ammonia* than for *Magnesia;* but if upon this assurance he were to administer these bodies together, he, or his patient, would soon discover that ammonia is developed with considerable pungency; now in this case the *Magnesia* forms a *triple acetate* with one part of the ammonia, and consequently sets the remainder at liberty.

III.—*The Methods directed for the preparation of the Ingredients are either inadequate to the accomplishment of the object, or they change, and destroy the efficacy of the Substances.*

The observations already offered upon *Formula* 40 will sufficiently explain the nature of the various errors comprehended under this head: so, again, if the virtues of a plant reside in *essential oils*, which are easily volatilized, or in *extractive matter*, which readily becomes oxidized, DECOCTION must necessarily destroy its efficacy; a striking example of this fact is presented us in the history of the *Laurel* and *Bitter Almond*: the poisonous influence of the essential oil and distilled water of these vegetable substances is well known, but their watery extracts are perfectly innocuous. A still more familiar example is to be found in the onion, or in garlic, which by simple coction is deprived of all its acrimonious qualities. On the other hand, an error equally injurious would be committed, by directing a simple infusion of a vegetable, whose medicinal properties depended upon resino-mucilaginous principles. Orfila found that an extract of Hemlock, prepared by boiling the dried powder in water, and evaporating the decoction, was entirely destitute of activity. See *Decocta*, *Infusa*, *Extracta*.

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* *M. Dive*, an apothecary of Mont de Marson, has lately announced that a current of carbonic acid, when passed through a solution of *Tartrate of Potass*, partly decomposes it, and he ascribes to the same agent the production of the *Bi-tartrate* in the juice of the grape during its fermentation; accordingly by mixing neutral tartrate with fermentable materials, we shall produce *Cream of Tartar* in the fermented liquor. *Journal de Pharm. Octob.* 1821. *p.* 487.

An instance of the baneful effects which may arise from an erroneous method of preparation happened some time ago to fall under my immediate notice and care; it was in preparing an infusion of the root of the *Veratrum* with *Opium*, as directed by Mr. James Moore, when the dispenser ignorantly substituted a spirituous for a vinous menstruum.

A very common error may be here noticed, which is that of prescribing a substance in such a form, as not to be acted upon with any effect by the solvent; as an example it may be stated, that in preparing an infusion of *Juniper Berries*, unless pains be taken by strong contusion to break the seeds, it will contain but little power as a medicine.

The unbruised seeds of mustard were commended by Dr. Mead* in Ascites, and by Bergius in Intermittents; Dr. Cullen, however, has very properly observed, that the seeds given in the above manner are never broken down, or dissolved in the stomach, but pass away entire by stool, and cannot, therefore, occasion any beneficial result.

It is unneccessary to multiply examples in proof of the numerous errors into which a physician must unavoidably fall who presumes to compose prescriptions without a knowledge of the chemical habitudes of the different substances which he combines. The file of every apothecary would furnish a volume of instances, where the ingredients of the prescription are fighting together in the dark, or at least, are so adverse to each other, as to constitute a most incongruous and chaotic mass.

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* In one remarkable case related by this Physician, the operation of the unbruised mustard-seed is stated to have been promoted by combining it with a decoction of *Broomtops*. Query. Was not the adjunct in this case the only efficient part of the remedy?

> "Obstabat aliis aliud: quia corpore in uno
> Frigida pugnabant calidis, humentia siccis,
> Mollia cum duris, sine pondere, habentia pondus."
>
> *Ovid Metamorph. lib.* 1. 19.

THE DOSES OF MEDICINAL SUBSTANCES are specific with respect to each, and can therefore be only learnt from experience; the young and eager practitioner, however, is too often betrayed into the error of supposing that the powers of a remedy always increase in an equal ratio with its dose, whereas THE DOSE ALONE VERY OFTEN DETERMINES ITS SPECIFIC ACTION. "*Medicines*," says Linnæus, "*differ from poisons, not in their nature, but their dose*," which is but a paraphrase of the well-known aphorism of Pliny, "*Ubi virus, ibi virtus.*"*—So that food, remedies, and poisons, may be said to branch into each other by indefinable gradations: Five grains of *Camphor* act as a mild sedative, and slight diaphoretic, but twenty grains induce nausea, and act as a stimulant; so again, *Opium*, in too large doses, instead of promoting, prevents sleep, and rather stimulates the bowels, than acts as a narcotic. Two ounces of any neutral salt are apt to be emetic, one ounce even of *Alum* to be cathartic, and two drachms to be refrigerant; in like manner, the preparations of *Antimony* either vomit, purge, or sweat, according to the quantity exhibited.

Would it not appear that *powerful doses rather produce a local than general effect?* Experience seems to prove in this respect, that the effect of an internal application is similar to that of an external impression; if violent, it affects the part only, as pinching does that of the skin, whereas titillation, which may be said to differ only from the former in degree, acts upon the whole system, and occasions itching and laughter, and if long continued, weakness, sickness, vomiting, and convulsions; in like manner, *Digitalis*, if given in large doses, acts immediately upon the stomach or bowels, becoming emetic and cathartic, but in smaller proportions it produces a GENERAL effect, increasing all the excretions, especially that of urine. I am well satisfied that the regulation of the dose of a medicine is even more important than it is usually supposed to be. *Substances perfectly inert and useless in one dose, may prove in another active and valuable.* Hence may be explained the great efficacy of many mineral waters, whilst the ingredients which impart activity to them are found comparatively inert, when they become the elements of an artificial combination; and hence probably the failure of many *alterative* medicines, when no other rational cause can be assigned for it. We need not seek far for an example of the very different and opposite effects which the same substance can produce in different doses; the operation of *Common Salt* is familiar to us all; Sir John Pringle has shown that in quantities such as we usually take with our food, its action is highly septic, softening and resolving all meat to which it is applied, whereas in larger quantities it actually preserves such substances from putrefaction, and therefore, when so taken, instead of promoting, destroys digestion.

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* The word "*Venenum*," was employed by the ancients to signify both a *poison* and a *medicine*; in the former of these acceptations it is used by *Virgil* in the following passage.

> "*Picus equum domitor, quem capta cupidine conjunx*
> *Aurea percussum virga, versumque* VENENIS,
> *Fecit avem Circe, sparsitque coloribus alas.*"
>
> *Æneid, Lib.* VII.

In the latter sense it is used by *Plautus*—

> "*Quia sorbitione faciam ego te hodie mea*
> *Item, ut Medea Peliam concoxit senem,*
> *Quem medicamentis, et suis* VENENIS *dicitur*
> *Fecisse rursus ex sene adolescentulum*
> *Item ego te faciam.*"

It is moreover probable that medicinal, like nutritive substances, are more readily absorbed into the circulating system when presented in small quantities, than when applied in more considerable proportions. It is upon this principle that a large quantity of food, taken seldom, does not fatten so much as smaller quantities at shorter intervals, as is exemplified in the universal good condition of cooks and their attendants. It is not pressing the principle of analogy too far to suppose that the action of *alteratives*, which require to be absorbed, may be more effectually answered by similar management, that is, *by exhibiting small doses at short intervals.*

The operation of medicines is influenced by certain general circumstances, which should be also kept in mind when we apportion their dose; e. g. AGE—SEX—TEMPERAMENT—STRENGTH OF THE PATIENT—HABIT—DIET—PROFESSION—CLIMATE—DURATION OF THE DISEASE—STATE OF THE STOMACH—IDIOSYNCRASY—and THE VARIABLE ACTIVITY OF THE MEDICINAL SUBSTANCE.

. Women generally require smaller doses than men. Habit, or the protracted use of a medicine, generally diminishes its power, although certain cathartics appear to offer an exception, for when long continued, their activity is proportionally increased, as is well known to every person who is familiar with the operation of the Cheltenham waters. Emetics also frequently become more powerful by repetition; but this is probably the effect of the mind; for after the frequent use of such a remedy, the mere sight of it, or even conversation relative to it, will excite nausea.

In apportioning the dose of a very active medicine, it is of the greatest moment to determine the relative degrees of power between the system and the remedy, and to know to what extent the latter is likely to be carried, consonantly with the powers of life to resist it; thus, after a patient has been exhausted by protracted and severe suffering and watching, a dose different to one at the commencement of the disease is requisite. The importance of this precept is impressed upon my mind, from having witnessed, in the course of my practice, several instances of the mischief which has arisen from a want of attention to it; that disease materially influences the condition of the body, and its susceptibility to remedial impressions has been already demonstrated. Emetics act very readily in febrile affections, while in those of the Neuroses* they produce their effects with difficulty.

Before we quit the subject of Dose, it may be necessary to observe, that there are many remedies that do not act with greater violence in a large dose than in one comparatively small; *Ipecacuan*, for instance, is more certain in its operation, but not more violent, when given in a large quantity; the same may be said of *Aloes*, and several other medicines.

The Variable Activity of a Medicine should also be appreciated, and perhaps the practitioner would act cautiously if he were to reduce the dose, should it be a very considerable one, whenever a fresh parcel of the medicine is commenced, especially of the powders of active vegetables liable to deterioration from being kept, as those of *Digitalis*, *&c.*

The Time of the Day at which remedies should be administered deserves likewise some attention. *Evacuating Medicines* ought to be exhibited late at night, or early in the morning. It would seem that during sleep, the bowels are not so irritable, and consequently not so easily acted upon, which allows time for the full solution of the substance; the same observation applies to *Alterative* and other medicines which are liable to suffer from a vexatious irritability of the bowels; it is on this account eligible to exhibit *Guaiacum*, *Pilulæ Hydrargyri*, &c. when they are not intended to purge, at bed-time. On the other hand, where the effects of a remedy are likely to be lost by perspiration, as is the case with *Diuretics*, many of which are by external heat changed into *Diaphoretics*, it may become a question with the judicious practitioner whether he cannot select some more favourable period for their exhibition.

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* See the dissertation on the operation of *Emetics*, page 112.

In fevers, it is of importance to consult in all respects the quiet and comfort of the patient; Dr. Hamilton, therefore, in his valuable work on Purgatives, very judiciously observes, that on this account, the exhibition of purgative medicines should be so timed, that their effects may be expected during the day.

In some cases, the time of administering a remedy must be regulated by the stage of the disease; thus, in fevers, a dose of opium will either increase the heat of the body, augment thirst and restlessness, or occasion tranquillity and sleep, according to the temperature of the body at the time of its administration; for this reason Dr. Currie advises us not to give the evening dose of Opium in Typhoid fevers, till very late, or about one or two o'clock in the morning, when the heat is subsiding, and moisture is coming on. Emetics administered for the cure of the slighter cases of Pyrexia should be given in the evening, as their operation leaves a tendency to sleep and diaphoresis, which it is useful to promote. Remedies that require to be *absorbed* will probably be more efficient in the morning after sleep; the old custom of giving medicines on a morning *fasting*, is not quite so absurd as some modern practitioners have been led to suppose.

THE INTERVALS BETWEEN EACH DOSE must be regulated by the nature of the remedy, and that of the objects which it is intended to fulfil, and whether it be desirable or not that the latter dose should support the effects of the preceding one, or whether there be any fear of a reaction or collapse taking place after the effect of one dose has subsided, unless immediately repeated; thus the effects of diffusible stimulants, such as ammonia and æther, are very evanescent, they should therefore be repeated at short intervals; the same may be said of *Diaphoretics*, especially the lenient ones; we ought not to allow the period between the doses to be so remote as to occasion any striking abatement in the impression: so Opium, where its primary and stimulant operation is required, as in diseases of debility, such as fevers of the typhoid type, should be given in small doses at short intervals, so that it may enkindle and sustain a uniform and regular state of excitement: but where the object is to mitigate pain, allay irritation, and produce sleep, it ought to be exhibited in full doses. at distant intervals. There is a caution also which it is very necessary to impress upon the practitioner, respecting the power which some medicines possess of accumulating in the system; this is notorious with regard to Lead and Mercury, and probably with the preparations of Arsenic, and some other metallic compounds. Dr. Withering has observed, that the repetition of small doses of *Digitalis*, at short intervals, till it produces a sensible effect, is an unsafe practice, since a dangerous accumulation will frequently take place before any signals of forbearance present themselves. I have already alluded to the possibility of mercurial accumulation, and its developement at a remote period.

Constitutional Peculiarities, or Idiosyncrasies, will sometimes render the operation of the mildest medicine poisonous. "*Virum novi*," says Gaubius, "*qui cum fatuum lapidum cancrorum pulvisculum ingessit, vix mitius afficitur quam alii ab Arsenico.*" I have seen a general Erysipelas follow the application of a blister, and tormina of the bowels, no less severe than those produced by the ingestion of *Arsenic*, attend the operation of purgatives composed of *Senna!* In some constitutions Antimony has been known to produce a ptyalism; Dr. James assured Sir George Baker that he knew six instances of it, although the patients thus affected had neither their teeth loosened, nor their breath made offensive. The peculiar susceptibility of certain individuals to the effects of particular plants is also very singular: Murray relates that unpleasant symptoms have been experienced by merely keeping *Aconite* for some time in the hand or on the bosom. I am acquainted with two persons in whom the odour of Ipecacuan always produces a most distressing dyspnæa: there are some idiosyncrasies so singular and incredible, that nothing but unimpeachable testimony could sanction our belief in their existence. Schenkius relates a case in which the general law of astringents and cathartics was always reversed. Donatus tells us of a boy whose jaws swelled, whose face broke out in spots, and whose lips frothed, whenever he ate an egg. Education and early habits certainly establish very extraordinary peculiarities in different countries with respect to various objects of diet and luxury: what shall we say of the refinement of the Ancients, who regarded the flavour of the Citron with disgust, while the odour of putrid fish was deemed by them so exquisite, that they carried it about in caskets of onyx as a favourite perfume!

The popular scheme of Gaubius for graduating the doses of medicine to different ages, which was published in the former editions of this work, is now omitted, as being less easy of application, than the following simple formula by Dr. Young.

RULE.

For children under twelve years, the doses of most Medicines must be diminished in the proportion of the Age to the Age increased by 12.

thus at two years to $\frac{1}{7}$—viz.

$$\frac{2}{2+12} = \frac{1}{7}$$

At 21 the full dose may be given.

Every general rule however respecting the doses of medicines will have exceptions. Thus children will bear larger doses of *Calomel* than even adults, and many medicines which do not affect adults, although exhibited in considerable quantities, prove injurious even in small doses to children.*

ON THE PARTICULAR FORMS OF REMEDIES, AND THE GENERAL PRINCIPLES UPON WHICH THEIR CONSTRUCTION AND ADMINISTRATION ARE TO BE REGULATED.

SOLID FORMS.

PULVERES. *Powders.*

The form of powder is in many cases the most efficient and eligible mode in which a medicinal substance can be exhibited, more especially under the following circumstances.

1. *Simple Powders.*

1. Whenever a remedy requires the combination of all, or most of its principles, to ensure its full effects, as *Bark*, *Ipecacuan*, *Jalap*, *&c.*

2. Where medicinal bodies are insoluble, and indisposed to undergo those essential changes, *in transitu*, which render

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* The Mechanical Physicians attempted to adjust the doses of medicines according to the constitution, by a mathematical rule ; thus they say, "*the doses are as the squares of the Constitution.*" And in the Edinburgh Medical Essays, there is actually a formal attempt to correct the errors of this rule. See "*An Essay towards ascertaining the doses of vomiting and purging Medicines, by Dr.* CHARLES BALGUY, *Physician at Peterborough.* Vol. 1. 167.

them operative; for it must be remembered that by minute division, every particle is presented to the stomach in a state of activity, being more immediately exposed to the solvent or decomposing powers of that organ.

3. Where the mechanical condition of the substance is such as to occasion irritation* of the stomach, as the *Sulphuretum Antimonii*, or in external applications to produce an improper effect upon the skin, as *Hydrargyri nitrico-oxydum.*

The degree of fineness to which substances should be reduced by pulverization, in order to obtain their utmost efficacy, is an important question. The impalpable form appears to be extremely injurious to some bodies, as to *cinchona*, *rhubarb*, *guaiacum*. and to certain aromatics, in consequence of an essential part of their substance being dissipated, or chemically changed by the operation; Fabbroni, for instance, found by experiment that cinchona yielded a much larger proportion of soluble extractive, when only coarsely powdered. I think it may be laid down as a general rule, that *extreme pulverization assists the operation of all substances whose active principles are not easily soluble, and of compound powders whose ingredients require, for their activity, an intimate intermixture; whilst it certainly injures, if not destroys, the virtues of those which contain as their active constituents, a volatile principle easily dissipated, or extractive matter which is readily oxidized.*

2. *Compound Powders.*

The disintegration of a substance is much accelerated and extended by the addition of other materials; hence the pharmaceutical aphorism of Gaubius, "*Celerior atque facilior succedat composita, quam simplex pulverisatio.*" Thus several refractory vegetable bodies, as *myrrh*, *gamboge*, *&c* are easily reduced by triturating them with sugar or a hard gum; and some gum resins, as *assafœtida* or *scammony*, by the addition of a few drops of almond oil; upon the same principle the Pharmacopœia directs the trituration of aloes with clean white sand, in the process for preparing *Vinum Aloes*, to facilitate pulverization and to prevent the particles of aloes, when moistened by the liquid, from running together into masses; some dispensers very judiciously adopt the same mechanical expedient in making a tincture of myrrh; so again, in ordering a watery infusion of opium, it will be judicious to advise the previous trituration of the opium with some hard and insoluble substance, as directed in the *Pulvis Cornu Usti cum Opio*, otherwise its particles will adhere with tenacity, and the water be accordingly unable to exert a solvent operation upon its substance. It is equally evident that in the construction of compound medicinal powders, the addition of an inert ingredient, which the mere chemist might condemn and discard as useless, not unfrequently acts a very important part in the combination, owing to its effects in dividing and comminuting the more active constituents: *the sulphate of potass* in Dover's powder acts merely in dividing and mixing more intimately the particles of opium and ipecacuan: the *phosphate of lime* appears to act in the same mechanical manner in the Antimonial Powder; so again, in the *Pulvis Contrajervæ compositus*, the prepared oyster-shells may be a necessary ingredient; in the *Pulvis Jalapæ compositus* of the Edinburgh college, the cream of tartar greatly increases the activity of the jalap, by breaking down its substance and dividing its particles; and Van Swieten observes that the operation of this resinous purgative is improved by bruising it with sugar, and adding some aromatic. The old combination of *Pulvis Helvetii* consisted of alum and dragon's blood, and there can be no doubt but that the effect of this latter ingredient, which has been often ridiculed, was to retard the solution of alum in the stomach, in consequence of which the preparation was likely to produce less inconvenience, and could therefore be administered in larger doses; the Edinburgh college has substituted gum Kino in their *Pulvis Aluminis compositus*, which may have the same effect in modifying the solubility of the alum.*

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* Camphor, unless it be presented to the stomach in a state of minute division, is liable to occasion heat and uneasiness in that organ. *Fothergill's Med. Observ.* vol. i. p. 432.

In rubbing together different substances, it is necessary to remember that there are many saline bodies, which in the dry state become moist, and even liquid, by triture with each other, and that they are consequently susceptible of mutual decomposition. This change is effected by the action of water, derived from the following sources.

1. *From the water of crystallization.* This always operates when the proportion contained in the original ingredients is greater than that which the products can dispose of; that is

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* In some cases the subject to be pulverized has been previously exposed to heat, but the doubtful influence of exalted temperature upon vegetable bodies, ought to afford us a lesson of extreme caution; the astringency of the stalks of the *Artichoke* is entirely destroyed by being gently heated in an oven, for after this operation they no longer strike a black colour with the salts of iron: another example is afforded us in the effects of heat upon Starch, which is thus changed into a species of gum that does not produce a blue colour with Iodine.

to say, whenever the capacity of the new compound for water is less than that of the original ingredients. By previously driving off this water by heat, we shall of course avoid such a source of solution, and no liquefaction can ensue. Thus, if recently burnt quicklime be triturated with calomel, the resulting mixture will be white, showing that no decomposition can have arisen, but add a few drops of water, and it instantly assumes a dark aspect. If *crystallized* sulphate of copper be triturated with super-acetate of lead, the resulting mixture will assume a fine green colour, but if the sulphate of copper be previously heated, and its water of crystallization driven off, no change of colour will be produced: if for super-acetate of lead we substitute muriate of lime, and the sulphate of copper be *crystallized*, we shall obtain a result of a yellow colour, but if the sulphate of copper be *anhydrous*, the product will be colourless, becoming however instantly yellow, like the former, on the addition of a drop of water; and on a further addition of this fluid, the yellow product in both instances will be rendered blue, which proves that a chemical decomposition has taken place, and that a muriate of copper has resulted; for this salt is rendered *yellow* by a small, and *blue* by a larger proportion of water. The *Cuprum Ammoniatum* presents another illustration, for the ingredients, when rubbed together, become extremely moist, and undergo a chemical decomposition. Certain resinous bodies also, as *myrrh*, become liquid by triture with alkaline salts, in which case the resin and alkali form a soluble compound, which the water of crystallization, thus set at liberty, instantly dissolves.

2. *From aqueous vapour in the atmosphere.* The water of the atmosphere does not act upon these occasions, unless it be first attracted and absorbed by one of the triturated bodies; e. g. if super-acetate of lead and recently burnt alum be triturated together, no change will be produced; but, if the burnt alum be previously exposed for a short time to the atmosphere, these bodies will in that case become liquid.

The physician, without this chemical knowledge, will be often betrayed into the most ridiculous blunders, an instance of which very lately came to my knowledge in a prescription for the relief of cardialgia and constipation, in the case of dyspepsia; it directed *sulphate of Soda* and *carbonate of potass*, in the form of a powder, but the *fiat* of the physician, upon this occasion, only served to excite the ridicule of the dispenser, who soon discovered that the ingredients in his mortar dissolved into a liquid.

During the exhibition of powders containing insoluble matter, it is always important to maintain a regularity in the alvine excretions, or an accumulation may take place attended with very distressing symptoms. Dr. Fothergill relates a case of this kind which succeeded the use of powdered bark; and Mr. Brande has communicated a similar instance of mechanical obstruction, produced by the habitual use of magnesia. I could also add, if it were necessary, some striking facts of a similar tendency, which occurred from eating bread that had been adulterated with pulverized *felspar*. The precaution seems more particularly necessary in the case of children, whose bowels are very impatient of extraneous and insoluble contents.* The dose of a powder ought not to exceed ʒj; and, when taken, should be diffused in water, wine, or any other convenient liquid; resinous and metallic powders require a thick and consistent vehicle, as syrup or honey, since they subside from those which are more fluid.

PILULÆ. *Pills.*

These are masses of a consistence sufficient to preserve the globular form, and yet not so hard as to be of too difficult solution in the stomach. The subject offers some extremely interesting points of inquiry. The following general rules will enable the practitioner to select those substances to which the form of pill is adapted, and to reject those to which it is not suitable, as well as to direct, *extemporaneously*, the most efficient mode of preparation.

1. THE SELECTION OF SUBSTANCES.

1. *Suitable Substances* are, 1, All remedies which operate in small doses, as *Metallic Salts*; and 2, Those which are designed to act slowly and gradually, as certain *Alterative Medicines*, or 3, which are too easily soluble when exhibited in other forms, as *Gamboge*, &c. 4, Substances which are not intended to act until they reach the larger intestines, as in pills for habitual costiveness; see *Aloes*. 5, Bodies whose specific gravities are

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* It is perhaps not generally known, that the *sugared plums* sold to children consist very frequently of *Plaster of Paris*; the introduction of such a substance into the intestines may often prove a source of mischief. I also understand, that it is no uncommon fraud to adulterate biscuits with the same substance. I confess I felt a great inclination to oppose the practice, lately suggested, of improving bad flour by the addition of *Magnesia*; I object to the introduction of any foreign and insoluble substance into our daily bread, and I am satisfied that the result of medical experience will sanction such an objection.

too considerable to allow their suspension in aqueous vehicles. *Efflorescent* salts may also be exhibited in this form, but they ought to be first deprived of their water of crystallization, or the pills composed of them will crumble into powder as they dry.

2. *Unsuitable Substances* are, 1, Those which operate only in large doses. 2, Which deliquesce. 3, Whose consistence is such as to require a very large proportion of dry powders to afford them a suitable tenacity, as *oils*, *balsams*, &c. 4, Substances that are so extremely insoluble, that when exhibited in a solid form they pass through the canal unaltered, as certain *extracts*.

Many remedies which are incompatible with each other in solution, may be combined in pills, unless indeed their medicinal powers are adverse or inconsistent, or their divellent affinities sufficiently powerful to overcome their state of aggregation.

II. THEIR FORMATION INTO MASSES.

This is a subject of far greater importance than is usually assigned to it, as will be more fully explained in the sequel.

1. Many substances, as *vegetable extracts*, may be formed into pills without any addition; others, as *gum resins*, become sufficiently soft by being beaten, or by the addition of a drop or two of spirit, or *liquor potassæ*. Some dry substances react upon each other, and produce, without the addition of any foreign matter, soft and appropriate masses. The *Pilulæ Ferri Compositæ* of our Pharmacopœia afford a very striking example of this peculiar change of consistence, which the mutual reaction of the ingredients produces by simple triture. The *Pilulæ Aloes Compositæ* offer another instance; for the extract of gentian, upon being triturated with aloes, produces a very soft mass, so that the addition of a syrup, as directed by the Pharmacopœia, is quite unnecessary. See *Form:* 12.

2. Many substances are, in themselves, so untractable, that the addition of some matter foreign to the active ingredients, is absolutely essential for imparting convenience of form. It is generally considered that very little skill and judgment is required in the selection of such a substance, provided it can fulfil the *mechanical* intention just alluded to—the fact however is, that *the medicinal power of the pill may be materially controlled, modified, or even subverted, by the mode in which it is formed into a mass.* Where the active element of a pill is likely to be improved by minute division, a gummy or resin-

ous constituent may be usefully selected; under the history of Aloes, I have alluded to a popular pill, known by the name of the *dinner-pill*, in which case the *mastiche* divides the particles of the aloes, and modifies the solubility of the mass. The *Pilulæ Opii* of the former Pharmacopœia of London, consisted of equal proportions of opium and extract of liquorice, and the mass was so insoluble that its effects were extremely uncertain and precarious; in the present edition, soap has been very judiciously substituted; but in certain cases where we wish to protract the influence of opium, or that of any other active body, so as not to obtain its full effects at once, we may very advantageously modify its solubility, by combining it with a gum resin or some substance which will have the effect of retarding its solution in the stomach. *The pilula e Styrace* of the Dublin college, presents itself as an efficient example of this species of pharmaceutical address; see also *Form.* 10, 11, 12. I am well acquainted with many formulæ whose utility has been sanctioned by experience, and I have no hesitation in believing that their salutary mode of operation would receive a plausible explanation from this simple law of combination. Dr. Young has very justly stated in his Medical Literature,* that the *balsam of copaiba* envelopes metallic salts, so as to lessen their activity; he says that the sub-carbonate of iron, made into pills with copaiba, was given for some weeks without any apparent effect; and that a few hours after the same quantity had been given, with gum only, the fæces were perfectly black. I do not know a more striking and instructive proof of the influence of a glutinous or viscid constituent, in wrapping up a metallic salt, and defending the stomach from its action, than is presented in the case published by the medical attendant Mr. Marshall, in consequence of the attempt of Eliz. Fenning to poison the family of Mr. Turner of Chancery-lane by arsenic, which she providentially administered in a heavy yeast dumpling. *Soap* is very frequently used for the formation of pill-masses, and it is an excellent constituent for substances likely to be injured by meeting with an acid in the *primæ viæ*; many resinous bodies may also be reduced to a proper consistence by soap, although in prescribing it, its levity should be attended to, or otherwise the pills will be too bulky; in general it will combine with an equal portion of any resinous powder, as *Rhubarb*, *Jalap*, &c.; it is of course ineligible where the substances are decomposed by alkalies, as *Tartarized Antimony*;

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* I shall avail myself of the present opportunity to recommend this work to the perusal of every student who is ambitious to become acquainted with the *Literature* of his profession.

this last precaution will also apply to *aromatic confection* as a vehicle, on account of the carbonate of lime contained in it. The *Conserve of Roses* has the advantage of retaining its consistency much longer than mucilage, but as it contains an uncombined acid, it is frequently inadmissible; it could not for instance be with propriety employed with the precipitated sulphuret of antimony. Pills made with mucilage, are apt to crumble when they are rolled out; this is the case with the *Pilulæ Hydrargyri sub-muriatis;* some extract therefore would be a more convenient constituent; in this particular case, however, the addition of a few drops of spirit would supersede the necessity of *any* constituent.

Crumb of bread furnishes a convenient vehicle for those salts which are ponderous, active in very small doses, or which are liable to be decomposed by other vehicles; but an objection is attached even to this, for it is liable to become so dry and hard when kept, that pills made with it will frequently pass undissolved. Swediaur mentions this fact with reference to Plenck's mercurial pill, as well as to one of corrosive sublimate, and he proposes for this reason to substitute *starch;* the addition, however, of a small portion of sugar will prevent the bread from becoming thus indurated, and with such a precaution it may be very safely employed. For the purpose of forming active vegetable powders into pills, such as Digitalis, Conium, &c., I am informed by Mr. Hume of Long Acre, that in his experience *molasses* or *treacle* is the best constituent that can be selected; for it undergoes no decomposition by time, but maintains a proper consistency, and preserves the sensible qualities of the plant quite unimpaired for many years. I have deposited in the cabinet of the College, specimens of such pills, of *hemlock* and *foxglove*, which retain the characteristic odour of these vegetables, notwithstanding they have been now made for several years. *Honey* has likewise the property of preserving vegetable substances; *seeds* may be kept in it for any length of time, some of which, on being taken out, washed, and planted, will even vegetate. It has also been used for the preservation of animal matter; the bodies of the Spartan kings, who fell at a distance in battle, were thus preserved, in order that they might be carried home.

Water will on some occasions be found a convenient expedient; powdered *Rhubarb* or *Jalap* may be thus made into masses without any increase of bulk, but the pills will be apt, if kept, to become mouldy.

3. In the formation of pills, the ingredients should be hastily rubbed together, whenever they are liable to be injured by long

exposure to the air; thus in the formation of *Pilulæ Hydrargyri sub-muriatis*, the compound is rendered less active by long-continued triture. *See Pulveres.*

4. In dividing pill-masses, it is usual to add to them, and envelope them in, magnesia; where calomel is present, I have satisfied myself by experiment that a *muriate of magnesia* is formed, and it is owing to this partial decomposition, that the surface of the pill exhibits a greenish hue; starch, powder of liquorice,* or orrice root, might perhaps under such circumstances be more judiciously preferred. In Germany, the powder of *Lycopodium* is generally used. Formerly, the pill was covered with gold leaf, which protected it from the influence of the stomach, and frequently rendered it unavailing.

It has been observed that many of the pill-masses directed in our pharmacopœias, are liable to become so hard and dry by being kept, that they are unfit for that division for which they were originally intended; indeed Dr. Powell considers it doubtful whether the greater number of articles had not better be kept in powder, and their application to the formation of pills left to extemporaneous direction; the necessity of this is farther apparent, when we learn that it is a common practice for the dispenser to soften these masses by the application of a hot spatula, or pestle which sometimes carbonizes, and frequently decomposes them.†

III. THEIR FORM OF PRESCRIPTION.

In our extemporaneous directions, it is necessary to apportion with accuracy the quantity of active materials which we may wish each pill to contain, and since the proportion of the *constituent* can rarely be exactly defined, the equable division of the whole mass into a given number of pills, will be safer than defining the weight of each pill.

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* There is one circumstance which sometimes renders the powder of liquorice objectionable upon such occasions; it is liable to irritate the fauces and occasion coughing; for this reason I always avoid its use in cases of pulmonary irritation.

† Some extracts become so hard, that in the state of pill they pass unchanged; this has occurred to me with the *extract of Logwood.* Astringent vegetable matter, in combination with iron, is frequently characterized by a hardness that is not exceeded by ebony, and which is perfectly insoluble; the action of iron upon the petals of the red rose furnishes a very striking instance of this fact; if the petals be beaten in an iron mortar, for some hours, they ultimately become converted into a paste of an intensely black hue; which, when rolled into beads and dried, is susceptible of a most beautiful polish, still retaining the fragrance of the rose. I have seen a necklace of this description; indeed these beads form an article of extensive commerce with the Turks, and are imported into Europe, through Austria, under the name of *Rose Beads*, or *Rose Pearls*.

A pill, the bulk of whose ingredient is vegetable matter, ought not to exceed five grains in weight, but where the substances which compose it are metallic and ponderous, it may without inconvenience weigh six or even eight grains.

TROCHISCI. *Troches*, or *Lozenges*.

As these are regarded as objects rather of confectionary than of pharmacy, the London and Dublin Colleges have not condescended to notice them; the Edinburgh Pharmacopœia, however, contains several formulæ for their preparation; and as the form of lozenge offers a very commodious and efficacious method of administering certain remedies, the theory of its operation deserves some notice in the present work. It is principally useful in cases where it is an object that the remedy should pass *gradually* into the stomach, in order to act as powerfully as possible upon the pharynx and top of the trachea, as in certain demulcents or astringents; for instance, *Nitre*, when intended to operate in relaxed or inflamed states of the tonsils is best applied in this manner; so is *Sulphate of Zinc* in chronic coughs, attended with inordinate secretion. In order to retard as long as possible the solution of the lozenge in the mouth, it ought to be composed of *several* demulcent substances, such as farinaceous matter, sugar, gum, and isinglass; for such a mixture will be found to answer the purpose better than any *one* of these articles taken by itself; (see p. 182) thus the farinaceous matter will prevent the sugar and the gum from being too soon dissolved; the viscidity of the sugar and gum will prevent the farinaceous matter from being swallowed so soon as it would otherwise be; and the isinglass will give a softness to the whole, and thus prevent any sharp points from stimulating the membrane.

SUPPOSITORIA. *Suppositories*.

This form of preparation is very ancient, and although it has of late years fallen into disuse, it affords an efficacious mode of administering many powerful remedies, and in some instances of producing effects which the same medicine would not command if given in any other form: besides which, it is found that after the stomach by long use has lost its susceptibility to the action of medicine, such a substance will operate with fresh and unabated force if applied to the rectum. There are two great indications which *Suppositories* are calculated to fulfil.

1. *The alleviation of pain and irritation*, especially when it arises from diseases of the bladder, prostate gland, uterus, and other parts in the vicinity. Abortion may be thus frequently prevented: to fulfil these intentions, a mixture of opium with two parts of soap, will be found eligible.

2. *The production of Catharsis.* In cases of Apoplexy, from the counter-irritation which these remedies are likely to occasion, much advantage may arise; and in the failure of more common measures, they may be applied with certain success in the cure of Ascarides; see *Formula* 164. Where a very efficient Suppository is required, one or two grains of *Elaterium* rubbed up with eight grains of hard soap, will present us with a combination of great utility.

ELECTUARIA. *Electuaries.*

This is an ancient form of prescription; for although the term "*Electuarium*" is first used by Cælius Aurelianus, yet the ἐκλὶκτον of Hippocrates, and the *Antidotus*, *Confectio*, *Mithridatium*, *Diascordium*, *Opiatum*. *Orvietanum* *Philonium*, *Theriaca*, and *Requies* of other authors, were all Electuaries. They differ from *Conserves* in this, that the sugar in the latter preparations is in a greater proportion, and is intended to *preserve* the ingredients; whereas in the former, it is merely intended to impart convenience of form; see *Confectiones*. Electuaries are, in general, *extemporaneous* preparations, composed of dry powders, formed into a proper consistence by the addition of syrup, honey, or mucilage; when however the latter substance is employed, the electuary very soon becomes dry and hard; and when common syrup is used, the compound is apt to candy, and in a day or two to grow too hard for use; this is owing to the crystallization of the sugar; Deyeux therefore states, that the syrup should be previously exposed to the heat of a stove so long as it forms any crystals, and that the residual liquor, which from the presence of some vegetable acid has no tendency to crystallize, may then be advantageously applied;—*Melasses* or Treacle may in some cases be employed, and from experiments which I have repeated with some care, I am enabled to state that the peculiar flavour of this liquid is entirely removed by a simple operation, which consists in diluting it with an equal weight of water, and then boiling it with about one-eighth part of powdered charcoal for half an hour, when the liquor is to be strained, and reduced by gentle evaporation to a proper consistence;* and moreover it appears, that active vegetable powders retain their characteristic qualities when immersed in *treacle*, longer than in any other excipient.

In selecting and prescribing this form of exhibition, the following general rules should be observed.

I. Those substances which are nauseous, deliquescent, which require to be given in large doses, or which are incapable of forming an intimate union with syrup, as *fixed oils*, *balsams*, &c. should never be prescribed in the form of an electuary.

II. The quantity of syrup directed must be regulated by the nature, and specific gravities, of the substances which enter into their composition, viz.

1. *Dry Vegetable Powders* require twice their weight of syrup, or of honey.
2. *Gummy and Resinous Powders* require an equal weight.
3. *Hard Mineral Substances* should be formed into an electuary with some conserve, as they are too ponderous to remain suspended in syrup. It deserves also to be noticed, that in consequence of the readiness with which metallic preparations undergo change, it will be generally advisable to keep the active ingredients in the form of powder, and to add them to the syrup only just before they are required; the Electuary of the French Pharmacopœia, which is commonly called "*Opiata Mesenterica*," will furnish a good example, "*quantumvis molle fuerit recens. progressu temporis, ob ferrum quod ipsi inest, mirè indurescit.*"

2. *Liquid forms.*

MISTURÆ. *Mixtures.*

These preparations are generally *extemporaneous*, in which different ingredients are mingled together, in the liquid form, or, in which solid substances are diffused through liquid, by the medium of mucilage or syrup: for prescribing mixtures, the following general rules may be laid down.

I. Substances which are capable of entering into chemical combination, or of decomposing each other, ought not to be mixed together, unless it be with a view of obtaining the new products as a remedy.

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* Crell's Annals, 1798, vol. 1.

II. Transparency is not a necessary condition,* and hence insoluble powders may be advantageously introduced into mixtures, if the following precautions be observed.

1. They must be divisible and mechanically miscible in the liquid.

2. They must not possess too great a specific gravity.

3. They must not render the liquid too mucilaginous or thick; *thus* f℥j *should seldom contain more than* ʒss *of a vegetable powder*, ℈ij *of an electuary and conserve; or* grs. xv, *or* ℈j *of an extract.*

III. The taste, the smell, and the general aspect of the mixture should be rendered as pleasant as possible; *thus milk covers the taste of bark, of the tinctures of guaiacum and valerian, and that of lime water; and a light decoction of the liquorice root disguises a bitter taste more effectually than sugar.* But in thus accommodating our medicines to the taste of our patient, let us be careful that we do not invalidate their powers, which often appear to be nearly connected with the sensible qualities which render them disgusting and objectionable.

The Physician may also produce occasional changes in the appearance of his mixture, in order to reconcile a delicate taste to its continuance; he never ought, however, to alter the essential part of plans which he finds advantageous.

A Draught differs merely from a mixture in quantity; it is usually taken at once, and should not exceed f℥iss; it should be always preferred when,

1. *The remedy is to be taken in a precise dose.*
2. *Whenever it is liable to spontaneous decomposition.*
3. *Whenever the action of the atmosphere occasions change.*

In apportioning the dose of mixtures, the following proportions are admissible, although not perfectly accurate. A Table Spoon full (*Cochleare Amplum*) f℥ss. Dessert Spoon (*Cochleare Mediocre*) more than fʒij. Tea Spoon (*Cochleare Minimum*) fʒj. A Wine Glass (*Cyathus*) although very variable, may be estimated as containing f℥iss. The custom of measuring the dose of a liquid by dropping it from the mouth of a phial is very erroneous; it will therefore be proper to dilute an active medicine that is to be so apportioned, with at least a triple quantity of water, that its real dose may not be essentially altered by any slight variation in the quantity.

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* A remedy may even owe its virtues to a precipitation, produced by admixture, as I have already stated.

ENEMATA. *Clysters.*
"*Lavamenta.*"

This form of applying a medicine furnishes the practitioner with many valuable resources, although the remedy has not escaped its due share of persecution. Paracelsus bestowed upon it the epithet "*turpissimum medicamentum,*" and Van Helmont that of "*pudendum medicorum subsidium.*"

It is calculated to fulfil the following indications, viz.

1. *To promote the tardy operation of a Cathartic, or to evacuate the bowels, where from delicacy of stomach, medicines cannot be retained, or from debility of body they cannot be safely administered.*

In the administration of a remedy of this kind, there are two essential circumstances, independent of the *strength* of its ingredients, which will modify its activity, viz. IMPULSE and QUANTITY, by which we obtain the stimulus of distention;* warm water without any adjunct may thus be made the means of overcoming those unrelenting obstructions, which had refused obedience to more common measures: Clysters, however, when most forcibly urged, rarely reach beyond the sigmoid flexure of the colon, and yet when the largest quantity of fluid which the bowels will admit is introduced with considerable impulse, the local impression is so powerful that it is at once extended by the medium of sympathy, through the whole of the alimentary canal, and very thorough and copious discharges result.

2. *To induce extreme relaxation.*

Which is best effected by an infusion of Tobacco. See *Tabaci Folia.*

3. *To produce Astringent and Anodyne, or Carminative effects.*

Common starch, with the addition of Tincture of Opium, is the most common and convenient form for this purpose. See also *Assafœtida* and *Terebinthinæ Oleum.* In some cases, the injection of *cold water* acts as a powerful astringent, and from its impression upon the rectum, affords instantaneous relief in the piles.

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* A most ingenious and useful apparatus has been lately contrived by Mr. Machell, of Great Ryder-street, St. James's, for administering Clysters, with which every country practitioner ought to become acquainted; in addition to the other advantages, it is capable of regulating the impulse and force of the injection with the greatest nicety, and does not, like the common syringe, throw up any air into the intestines, a circumstance which is very important in many cases, as in *Dysentery,* &c.

4. *To act as an emollient fomentation.*
5. *To convey nutriment.*

In the administration of Clysters, for the fulfilment of any of the last four indications, it is obvious that the stimulus of distention should be avoided, as being incompatible with our object; the quantity or bulk of the solution, ought to be also carefully graduated; to prevent, for example, the opiate clyster from being too soon returned, Dr. Cullen has remarked that it seldom should be made of more bulk than that of three or four ounces of liquid, and this also of a very mild kind. The proportions of fluid vehicle necessary for the different stages of life, under ordinary circumstances, may be stated as follows: —An infant at its birth, or soon after, requires about one *fluid ounce;* a child between the age of one and five years, from three to four *fluid ounces;* a youth of ten or fifteen, from six to eight *fluid ounces;* and an adult may take twelve. With regard to the dose of the active ingredient of a *Lavement*, it may be estimated as triple that when taken by the mouth.

INJECTIONS.

Under this head may be comprehended the various medicinal preparations which are employed as local applications; to the urethra for the cure of gonorrhœa, and to the vagina for that of the different discharges to which females are liable.

With respect to the former of these it has been truly observed, that "among the whole class of remedies employed for surgical purposes, there is scarcely one which has occasioned a greater diversity of opinion;" to enter, however, into an examination of this subject would be entirely foreign to the intention of the present work; it is only necessary to state, that for their preparation the same principles of combination apply, as have been already investigated under the head *Misturæ.* In some cases the practitioner will find it useful to ensure the entire solution of his active ingredient; while in others, the presence of a precipitate may enhance the efficacy of the application, as illustrated by *Form.* 62.

In the preparation of injections for the cure of female discharges, it must be remembered that if they be of a vegetable nature, their efficacy wholly depends upon the *Tannin* which they contain, and the prescriber must therefore take care not to invalidate the force of this principle by any incompatible additions.

And it deserves to be remembered, that as *Tannin* has the power of coagulating animal mucus, and of forming with it an insoluble precipitate, its administration as an injection, is liable to occasion the evacuation of whitish or ash-coloured flakes, which will come away from time to time, and excite in the patient's mind, says Mr. Clarke, the apprehension that she is voiding portions of the internal parts of the body, unless her mind be prepared for the occurrence by a previous explanation, and which the judicious practitioner will not neglect to afford. In some cases it will be necessary to correct the irritating effect of the astringent by the addition of a demulcent, as exemplified in *Form.* 61.

REMEDIES OF EXTERNAL APPLICATION.

This class of medicinal agents may be divided into two orders, viz.

1. Those whose effects are entirely *local*, as exemplified in the application of certain *refrigerating* embrocations, *stimulating* cataplasms, and *astringent* unguents.
2. Those which excite general effects, or produce an influence upon parts remote from those to which the remedy is more immediately addressed, as illustrated by the operation of mercurial liniments and unguents, or by the general tonic effects of adhesive plasters.

With respect to the former of these divisions it is unnecessary to multiply our remarks; the objects which they embrace belong more particularly to the department of surgery, and from the investigation of the different modes and forms of external application we shall hereafter derive very ample and instructive illustrations. In considering the objects of the latter division, a very interesting and important question immediately suggests itself for our consideration—How far a medicinal substance, when locally applied to the surface of the body, may be capable of affecting the general system, or some of its more remote parts?—the experienced practitioner will feel no hesitation in admitting numerous proofs of the existence of such agency; and it would seem probable that topical applications may produce general effects by several distinct modes of operation, viz.

1. *By exciting an impression on the nervous system.*

2. *By modifying the cuticular discharge.*
3. *By being absorbed into the circulation.*

In considering the different forms of external applications, it will appear that, for their extemporaneous construction, preparation, and application, the same scientific knowledge, practical skill, and pathological acumen will be required, as we have already stated to be so indispensably requisite to enable the physician to prescribe, and the pharmaceutist to prepare the various remedies intended for internal administration; although in regard to the former, it may be stated generally that the prescriber will more frequently be called upon to exercise that species of knowledge and address which enables the practitioner to impart a convenient and efficient *consistency* to his remedy; for an external application is far more dependent upon this circumstance for its efficacy, than one intended for internal use.

LOTIONES:

Remedies of a liquid nature, designed for external application.

Under this generic term, which strictly signifies a *wash*, may be comprehended several species of medicine, calculated for the fulfilment of different indications, as EMBROCATIONES, COLLYRIA, FOMENTA, LINIMENTA, &c. In some instances these applications are entirely local in their effects, as where a morbid action of the skin is changed by a stimulating lotion, as exemplified in the cure of Psora by the *decoction of Hellebore*, or the relaxed vessels of the tunica conjunctiva of the eye by an astringent collyrium; in other cases, they operate upon parts not in contact with the remedy, through the medium of sympathetic communication, as where cholic and disorders of the bowels are abated by the application of warm fomentations to the surface of the abdomen, or where paralytic affections are relieved by pumping cold water on the part affected.

EMBROCATIONES. These, as the term* denotes, are compositions of spirit, decoctions, infusions, or other liquids, applied by *sprinkling* or rubbing them on an affected part.

LINIMENTA† are understood to differ from embrocations in consistence, the former being of an oily, or mucilaginous density, which increases their efficacy by imparting a certain emollient power, in addition to their other virtues. In popular language, however, liniment and embrocation are generally considered synonymous terms. They constitute a valuable class of remedies, and the observations which Dr. Percival has offered on their utility well merit the attention of the medical practitioner. "Volatile and anti-spasmodic liniments are highly useful remedies, and it is to be lamented that external applications of this kind are not more frequently employed, for there is just reason to apprehend that powerful effects might be expected from them in various diseases." In chronic affections of the viscera, such applications appear highly serviceable, not only from the friction to which they give origin, but from the influence of that species of sympathy which appears to depend upon the mere proximity and continuity of parts, and which, as Sir Gilbert Blane has observed, is particularly displayed "in the containing on the contained parts, as that of the integuments on the subjacent viscera."

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* Ἐμϐροχη, from ϐρεχω, *irrigo.*

† *Illinire, to besmear.*

COLLYRIA.[*]—Liquid applications to the eyes. The Pharmacopœia Chirurgica contains several different formulæ for lotions of this kind, some of which are simply astringent, while others combine also the virtues of a stimulant.

CATAPLASMATA.[†] *Poultices.*

External applications of a pulpy, and somewhat coherent or tenacious consistence.

They are generally extemporaneous preparations, and are calculated to answer several different indications, viz.

1. As STIMULANTS, e. g. *Cataplasma Sinapis*, L. D. which generally inflames the surface to which it is applied so much as to raise blisters; common salt also, *muriate of soda*, constitutes the active ingredient of a poultice which has lately been brought into considerable repute for the reduction of indolent strumous swellings and enlargements of the glands.[‡]
2. ANTISEPTICS—*Cataplasma Fermenti*. L, (see page 207.) A powerfully antiseptic cataplasm may be also made by stirring finely powdered charcoal into a common linseed meal poultice. A cataplasm of the boiled carrot, beat into a pulp, has been likewise found very effectual in sweetening foul ulcers.

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[*] Κολλυριον. This term was formerly applied to any medicament, solid or liquid, employed to restrain defluxions.

[†] Καταπλασσω, *illino*, to besmear.

[‡] See *Pharmacopœia Chirurgica.*

3. Sedatives. The most efficient of which are composed of *Conium*, *Digitalis*, or *Hyoscyamus*, and are eminently serviceable in cancerous and scrofulous sores of a highly irritable and painful nature, to diminish their sensibility and correct the acrid discharges. See *Form.* 18.

4. Refrigerants. In the formation of a cataplasm for this purpose we must avoid the introduction of substances that are slow conductors of caloric ; suppose for example our object is to apply the *sub-acetate of lead* in this form, it will in such a case be judicious to mix the linseed meal, with oatmeal, or crumb of bread ; for if the former substance be used singly it is liable, from its tenacity, to become hard and dry, and in that state to augment the temperature which it was designed to diminish.

5. Emollients.—(The *modus operandi* of these agents is explained at p. 173.) For which purpose the common farinaceous poultice is the most eligible, made by soaking slices of bread in milk, and simmering them together over a gentle fire until they are reduced to the proper consistence, which ought to be such as prevent its spreading farther than is designed, and yet not so hard as to occasion any mechanical irritation ; the whole is then to be beat smooth with a spoon, and applied as warm as the patient's feelings will readily admit. Some practitioners have doubted the propriety of milk as an ingredient in this composition, and have preferred water as an excipient, not only because the former is very liable to turn sour, but because it does not possess greater powers as an emollient than water ; the observations of the editor of the Pharmacopœia Chirurgica upon this question are judicious, and worthy our notice ; " the objection," he says, " will certainly hold good whenever stale milk is made use of, or if the same poultice be kept too long applied ; but if the milk be fresh, and the poultice renewed night and morning, we do not know any thing that occasionally gives such ease and comfort to the patient as this form of cataplasm. If water be substituted for milk, the poultice is seldom of sufficient tenacity ; it is true that this inconvenience may be remedied by the addition of a little linseed meal, but in some instances the meal appears to fret and irritate

the skin so much, that patients undergo considerable uneasiness from this cause; an objection to which the cataplasm of bread and milk is seldom subject, especially if it be not applied too hot."

Every substance, whether liquid or solid, may become an ingredient in this species of composition, and although judicious and experienced surgeons have of late very considerably improved the form of their cataplasms, yet the principles of medicinal combination, which it has been the object of the present work to investigate and expound, will suggest many important hints for the farther extension of their utility; and although the direction of them is more frequently left to the nurse than to the medical practitioner, yet in adapting them to each particular occasion some share of chemical knowledge may be necessary; we have already seen that attention must be paid to the selection of ingredients, with respect to their powers of conducting heat, and it is evident that care must be taken not to reduce into pulp, by decoction, substances that contain volatile principles; while in the preparation of active liquids to be subsequently mixed with linseed meal, it is equally evident that we must be directed by the chemical nature of their composition.

EMPLASTRA. L.E.D. *Plasters.*

These are solid and tenacious compounds, adhesive in the ordinary heat of the human body; they owe their consistence to different causes, viz.

1. *To a due admixture of wax or fatty matter, and resin.* e. g. *Emplast :. Ceræ*, &c.

They may be said to differ only in *consistence* from liniments, ointments, and cerates; Deyeux* accordingly proposes to distinguish them by the appellation of *Solid Ointments.*

2. *To the chemical combination of the semi-vitreous oxide of lead with oils or fat*, e. g. *Emplast : Plumbi.*

3. *To the chemical action of the component parts of the plaster on each other*, as *Emplast : Ammoniaci*, &c.

Plasters are generally kept in rolls, wrapped in paper, and when to be used they are melted and spread on leather; in performing this operation the practitioner ought not to apply a heat above that of boiling water, for if metallic oxides be present the fatty matter will, at a higher temperature, reduce them, in consequence of the powerful affinity of oil for oxygen at an exalted temperature; and if aromatic substances enter as ingredients, they will thus suffer in their strength, besides which the fat itself will undergo a very injurious change, by a mismanaged application of heat, and the plaster will be less adhesive.

---

* Annales de Chimie, vol. xxxiii. p. 52.

They are employed as remedies to answer two general indications; *mechanically*, to afford support to muscular parts, and to prevent the access of air; and *medicinally*, to operate as stimulants, discutients, rubefacients, or anodyne applications. That by affording an artificial support to the various parts of the body, by the application of plasters, we are capable in certain diseases of effecting much benefit, is a truth to be explained upon the principles of physiology, and is daily confirmed by the results of practice; thus by giving support to the muscles of the back, how frequently the stomach is steadied and strengthened? Diseases of the kidneys are in the same way very frequently relieved by tight bandages around the loins; the existence of an intimate connexion between the external and internal parts is strikingly exemplified by the distressing effects which are often experienced in weak habits, such as sickness, giddiness, and other uneasy sensations, from a want of any usual compression, as that of stays, under waistcoats, &c. The support afforded to persons who have been tapped in Ascites is another instance; where our object is simple support, we should of course select a plaster which is the most adhesive and the least irritating. Many plasters which have gained great celebrity for their curative virtues will be found to owe all their powers to their adhesiveness, such is the *Emplastrum Oxidi Ferri Rubri* of the Edinburgh Pharmacopœia, for it is impossible that the iron should communicate any tonic effect. The same observation applies to many of those empirical plasters which have at different times acquired so great a share* of popular applause.

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* A Quaker of the name of STERRY, in the Borough, prepares a plaster of this description, which is sought after with great avidity. What a blessing it would be upon the community, if every nostrum were equally innocuous!

A COLLECTION OF FORMULÆ

INTENDED TO ILLUSTRATE THE FOREGOING PRECEPTS, and to furnish the inexperienced Prescriber WITH A SERIES OF

USEFUL AND INSTRUCTIVE LESSONS.

EXPLANATION OF THE KEY LETTERS.

The *Modus Operandi* of the different elements of each formula is designated by a KEY LETTER, or *Symbol*, which is printed in Antique type, and placed in the margin opposite to each. This letter refers to a corresponding one in the synopsis, and thereby shows the division containing an exposition of the principle upon which the operation of the ingredient is supposed to depend.

Two or more KEY LETTERS denote that the element against which they are so placed, has several modes of operation, whilst the order in which the letters succeed each other, serves to show the relative importance of them.

Where any one of the letters is *small*, *i. e.* not a capital, it denotes that the operation which it is intended to express is only *incidental* to, or subordinate in, the general scheme of the combination.

When any number of elements are included within a *vinculum* or bracket, it is intended to show that they operate but as one substance, or, that the virtues of each are not independent of the other: in this case the KEY LETTER within the bracket expresses upon what principle this unity depends, whilst that on the exterior shows the action of such a combination upon the base, or the part which it performs in the general scheme of the Formula.

Let us exemplify it by a reference to *Formula* 78, which presents us with a Purgative, in conjunction with a Stimulant. The base is *Aloes*, which is succeeded by *Scammony*, and *Extract of Rhubarb;* these substances appear by the bracket, to act in unison, a concurrence which the interior letter (B) shows to depend upon their being SIMILAR REMEDIES ; the letter also on the exterior shows that its operation upon the base depends upon the same principle. We next come to powdered *Cap-*

sicum, and *Oil of Cloves;* these ingredients are also shown by a bracket to act in unity, and the letter (B) in the interior, denotes that it is in consequence of their possessing a similar mode of action, whilst the letter (G) on the exterior, announces that they act in the general scheme for the purpose of fulfilling a second indication; at the same time the smaller letter (e) informs us that the combination acts, at the same time, as a *corrector* to the base.*

---

* In my Lectures I have usually employed different colours for the purpose of expressing the objects of each ingredient in a formula; in this manner very useful and instructive charts might be constructed; this hint may perhaps induce the industrious student, who is anxious to become a master in the art of prescribing, to attempt a synopsis upon this plan.

NARCOTICS.

1. ℞· Extract: Hyoscyami ℈j.
Camphoræ (alcoholis ope in pulv:
redact:) gr. viij. - - - - - - **B**.

Fiant pilulæ xij, quarum sumantur tres, omni nocte.

---

2. ℞· Extract: Conii ʒj
Folior: Conii exsiccatorum
et in pulverem tritorum, q. s. - - - - **A**
ut fiant Pilulæ, singulæ grana duo pendentes.

Initio sumat æger pilulam unam pro dosi, mane et nocte; postea, binas, et deinde tres vel quatuor; semperque augeatur dosis quantum possit.

Stoerck.

---

3. ℞· Opii puri gr. iv
Extract: Hyoscyam: et - - - **B** } **B**
Extract; Conii āā gr. xv - - - **B**

Fiat massa in Pilulas sex dividenda, e quibus sumatur una omni nocte.

---

4. ℞· Extract: Conii
et
Extract: Hyoscyam: (*in vacuo*, pp:)
āā gr. iij - - - - - - - **B**

Fiat Pil. bis quotidie sumenda.

---

5. ℞· Tinct: Opii ♏xv
Syrup: Papaveris fʒij - - - - - **A**
Spir. Cinnamom: fʒj - - - - - **O**
Aquæ puræ f℥jss - - - - - - **N**

Fiat Haustus, invadente paroxysmo caloris in febribus intermittentibus sumendus.

Lind.

6. ℞. Opii puri, et
Camphor: āā ʒss - - - - - - **F**
Emplast: Lithargyri ʒij - - - - **O**
Sit scuto pectori.

Bree.

---

7. ℞. Mist: Camphoræ f℥j
Spir: Ether: comp: fʒss - - - **B**
Tinct: Opii ♏x - - - - **F** }
Syrup: Papav: fʒj - - - - **A**
Fiat Haustus hora decubitus sumendus.

---

8. ℞. Tinct: Opii fʒj
Infus: Lini f℥vj - - - - - - **GN**
Fiat Enema.

---

9. ℞. Opii puri gr. ij
Mucilag: Acaciæ f℥ss - - - **M** } **NG**
Lactis tepefacti f℥vj - - -
Misce pro Enemate.

Hartman.

---

10. ℞. Opii puri gr. j
Pil: Galb: comp: gr. v - - - **MPs**
Fiat Pilula, h. s. sumenda.

---

11. ℞. Opii puri gr. j.
Pil: Aloes cum Myrrha gr. iv. - - **EM**
Fiat Pilula, h. s. sumenda.

12. ℞ Opii puri gr. ij.
Extract: Aloes Spicat: gr. x - - **EM**
ut fiat Massa in Pil: iij dividend: e quibus sumatur una, h. s.

---

13. ℞ Opii puri gr. j.
Extract: Aloes Spicat: gr. iij. - - **E 1 M**
Extract: Gent: gr. v. - - - **E 2**
Fiat Massa in Pil: duas dividend: et sint pro dosi.

---

14. ℞ Opii puri gr. ij
Saponis duri Hispan: gr. iv. - - **LN**
Simul contunde, donec corpus unum sit, et fiat Massa pro Suppositorio.

---

15. ℞ Opii puri gr. ij.
Confect: Aromat: ʒ ss - - - **GN**
Fiat massa in Pilulas viij dividenda, e quibus capiatur una, quarta quaque hora.
In Typhus.

---

16. ℞ Opii duri contriti gr. iv.
Aquæ bullientis f℥ ijss - - - - **D**
Infunde, prope ignem, per horam, et cola.

℞. Liquoris Colati f℥j
Acid: Nitric: dilut: ♏ x - - - **E 1**
Træ Aloes comp: f ʒj - - - - **E 2**
Fiat Haustus.

NARCOTICS.

17. ℞. Conii Foliorum exsiccat: ℥j
Coque ex aquæ Oiss ad Oij
et cola.

Panni lanei hocce decocto calido madefacti, deinde expressi parti affectæ imponantur, et sæpius renoventur.

Collin.

In Carcinomatous, Venereal, and sordid Ulcers.

---

18. ℞. Conii Folior: exsiccat: ℥ij
Medullæ panis ℥vj - - - - - } **NO**
Aquæ Oiss - - - - - }
Coquantur simul, ut fiat Cataplasma.

---

19. ℞. Extract: Conii
Extract: Hyoscyam: āā gr. v - - - **B**
Mucilag: Acaciæ fʒij - - - - - **N**
Tere simul, donec quam optime misceantur, et deinde adde,

Liquor: Ammon: Acetat: - - - - }
Aquæ puræ āā f℥ss - - - - - } **G**
Syrup: Rhæados fʒj - - - - - **O**
Fiat Haustus, quarta quaque hora sumendus.

In Pulmonary irritation.

J. A. P.

ANTISPASMODICS.

20. ℞. Tincturæ Castorei fʒj
Ætheris: Sulphurici ♏x - - - - - **B**
Tinct: Opii ♏vij - - - - - - **G**
Aquæ Cinnamomi f℥iss - - - - **N O**
Fiat Haustus, ter quotidie sumendus.

21. ℞. Moschi gr. xv
Camphoræ gr. v - - - - - - **B**
Spir: rectificat: ♏ ij - - - - - **L**
Confect: Rosæ gall: q. s. - - - - **O**

Camphoram primùm cum Spiritu tere, et deinde, secundum artem, fiat bolus.

---

22. ℞. Moschi ℈j
Acaciæ gummi contriti ʒss - - **M**

Tere optime simul, et adde paulatim
Aquæ Rosæ f℥j - - - - - - **O**
Ætheris Sulphuric: fʒj - - - - - **B**

Fiat Haustus, p. r. n. sumendus.

---

23. ℞. Assafœtidæ ʒj
Aquæ Menth: Pip. f℥jss - - - - **L**

Tere assafœtidam cum Aquâ paulatim instillata, donec quam optime misceantur, et deinde adde

Tinct: Valerian: Ammoniat: fʒij -
Tinct: Castorei fʒiij - - - - **B** } **B**
Ætheris Sulphuric: fʒj - - - -

Fiat Mistura, de qua sumatur Cochleare unum amplum secundis horis.

Signetur—*Anti-hysteric Mixture.*

---

24. ℞. Mist: Camphoræ f℥j
Spir: Ammoniæ Fœtid: fʒss - - - - **B**

Fiat Haustus, urgenti flatu, sumendus.

---

25. ℞. Valerianæ Radicis, in pulverem redact: ℈j
Tinct: Valerian Ammoniat: - - - - **A**
Tinct: Castorei āā f ʒj - - - - -
Mist: Camphoræ fʒxij - - - - - **B** } **B**

Fiat Haustus ter quotidie sumendus.

26. ℞. Tabaci Foliorum ℈j
Aquæ ferventis f℥viij

Macera per Horam in vase leviter clauso, et cola. Fiat pro Enemate.

---

27. ℞. Massæ Pil: Galb: comp: gr. x.

Divide in Pilulas binas, et sint pro dosi.

---

28. ℞. Tinct: Opii ♏vj
Vini Ipecacuanhæ fʒj - - - - -
Aquæ puræ f℥j - - - - - -
Symp: Simpl: fʒiij - - - -
Sodæ Subcarbonat: gr. xxiv - - - -

Sumat Infans sextam partem quartis vel sextis horis.

In Tussi Convulsiva.

R. Pearson.

---

29. ℞. Asafœtidæ ʒij.
Decoct: Avenæ f℥x - - - - -

Misce pro enemate, secundum artem.

In Flatulent Cholic.

Bang.

---

30. ℞. Moschi gr. xij
Sacch: purificat: ℈ij - - - - -
Acaciæ Gummi Contriti ℈j - - - -

Simul tritis admisceantur Jusculi cujusvis tenuioris f℥iv, ut fiat enema, alternis vel tertiis horis injiciendum.

Wall.

ANTISPASMODICS.

31. ℞. Cinchonæ lancifoliæ Corticis contriti : ℥j
Valerianæ Radicis Pulv : ʒiij - - - **G**
Syrup : Aurantiorum q. s. - - - **O**

Ut fiat electuarium, cujus devoret drachmam, mane ac vesperi.

Mead.

---

32. ℞. Tinct : Digitalis ♏ x—xv
Mist : Camphoræ f℥x - - -
Tinct: Columbæ f℥i - - - **F** } **GO**

Fiat Haustus, bis quotidie sumendus.

In palpitation of the Heart, accompanied with great nervous irritability.

TONICS.

33. ℞. Infus : Cascarillæ f℥iss
Tinct : Cascarillæ fʒij - - - - **A**
Tinct : Zingiberis fʒj - - - - **G**

Fiat Haustus ter quotidie sumendus.

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34. ℞. Ferri Tartarizati gr. x
Pulv : Calumbæ gr. xv - - - **FM**

Fiat Pulvis, quarta quaque hora sumendus.

---

35. ℞. Infusi Quassiæ f℥x
Tinct : Calumbæ fʒj - - - - **B**
Tinct : Ferri muriat : ♏ x - - - **F**

Fiat Haustus, quotidie, hora meridiana sumendus.

TONICS.

36. ℞. Ferri Ammoniati ʒj
Extract: Gentian - - - - - - **FM**
et
Extract: Aloe āā ʒss - - - - - **GM**

Contunde simul, et divide massam in Pil. xxx quarum sumat binas ter quotidie.

Tonic and Purgative.

---

37. ℞. Cinchonæ lancifoliæ contritæ ℥ss
Magnesiæ Sulphatis ʒvj - - - - - **G**

Tere optime simul, et divide in quatuor partes, ex quibus sumatur una alternis horis inter paroxysmos.

In Intermittents.

Cleghorn.

---

38. ℞. Ferri Carbonatis gr. v—x
Pulv: Valerian: ʒss - - - - - **G**
Syrup. Zingib: q. s. - - - - - **BO**

Fiat Bolus.

---

39. ℞. Infusi Gentianæ comp: f℥j
Liquor: Potassæ Sub-carb: fʒss - - **CLG**
Tinct: Cascarillæ fʒj - - - - - **B**

Fiat Haustus.

TONICS.

40. ℞. Cinchonæ lancifoliæ Cort: contus: ℥ss
Coque ex aquæ puræ f℥xvj
ad consumpt: dimid: adjectis sub finem coctionis,
Serpentāriæ radicis contus: ʒij - - **B**
Stent per horam, et Colaturæ admisce,
Spir: Cinnamomi comp: f℥iss - - **E**
Acid: Sulphuric: dilut: fʒiss - **G**
Sumantur f℥ij sexta quaque hora.

Pringle.

---

41. ℞. Decoct: Cinchonæ f℥iiss
Infus: Gentian: comp: f℥j - - -
Tinct: Cascarillæ fʒij - - - - **B** } **B**
Liquor: Potassæ Sub-carb: fʒij - - **G1**
Fiat Mistura, de qua sumr: Cochl: duo ampla bis de die.

---

42. ℞. Decoct: Cinchonæ f℥vj
Tinct: Cinchonæ f℥ss - - - - **A**
Confect: Aromat ℈j - - -
Spir: Ammon: Aromat: f℥j - **B** } **GE**
Fiat Mistura.

---

43. ℞. Ferri Ammoniat: gr. v.
Rhei Rad: Contrit: gr. iij. - - - **G**
Fiat Pulvis ex quolibet vehiculo idoneo quotidie sumendus.

---

44. ℞. Cinchonæ Pulv: subtiliss:
Potassæ Super-tart: āā ʒj - - - **G1**
Caryophyll: contrit: No. xxx. - - **G2**
Misce, et detur drachma cum semisse tertiis horis.

Petrie.

ASTRINGENTS.

53. ℞. Aluminis Contriti gr. v.
Myristicæ Nucl : Contrit. gr. v - - - - **E**
Extract : Gentian : q. s, - - - - **FO**

ut fiat massa in Pil : ij dividend :

---

54. ℞. Lactis Vaccini bullient : oj.
Aluminis Contrit. ʒij.

Ebulliant simul ut fiat coagulum ; coletur serum, et sumatur cyathus, subinde.

---

55. ℞. Gallarum pulverisat : ʒj.
Adipis præparat : ʒj. - - - - - **O**

Fiat Unguentum, parti affectæ applicand :
In Hæmorrhoidibus. *Cullen.*

---

56. ℞. Infus : Ros : f℥iiiss
Alum : contrit : gr. x - - - **B**
Oxymel fʒiij - - - - - - **BO**

Sit pro Gargarismate.

---

57. ℞. Plumbi Super-acetat : gr. iij
Opii puri gr. i - - - - - **B** } **B**
Extract : Conii gr. x - - - -

Fiat Massa in Pilulas tres dividenda ; quarum sumatur una bis quotidie, superbibendo haustum ex acido acetico comp :

---

58. ℞. Infus : Cuspariæ f℥j
Tinct : Catechu fʒj - - - - **B**
Pulv : Ipecac : gr. x - - - - **G**

Fiat Haustus.

ASTRINGENTS.

59. ℞. Zinc : Sulphat : gr. x
Myrrhæ in pulv : trit : ʒiss - - -
Confect : Ros : q. s. - - - - -
ut fiant Pilulæ xx, e quibus sumantur binæ bis quotidie.

---

60. ℞. Tinct : Ferri Muriat : ♏ x
Aquæ puræ f℥j - - - - - -
Fiat Haustus, tertia quaque hora sumend :
In Uterine Hemorrhage.

---

61. ℞. Cort : Quercus contus : ʒvj.
Aquæ distillat : f℥x
Coque per sextam partem horæ, et cola.

℞. Colaturæ et
Infus : Lini āā f℥iv - - - - - -
Sit pro injectione per vaginam.
In Uterine Discharges attended with an irritable state of the Vagina.

EMETICS.

63. ℞. Antimonii Tartarizati gr. i
Vini Ipecac : fʒij - - - - - -
Aquæ puræ f℥ss - - - - - -
Fiat Haustus.

EMETICS.

64. ℞. Antimonii Tartarizati gr. ij
Aquæ distillatæ f℥iv - - - - . N

Solve—Hujus danda sunt cochlearia duo mediocria, singulis horæ quadrantibus, donec vomitus excitatus sit.

---

65. ℞. Pulveris Ipecacuanhæ ʒss
Antimonii Tartarizat: gr. i. - - - B } B
Tinct: Scillæ fʒi - - - -
Aquæ distillat: f℥viss - - - - N

Fiat Mistura, cujus sumat quamprimum cochlearia majora quatuor; et cochlearia duo, sexta quaque horæ parte, donec supervenerit vomitus.

---

66. ℞. Zinci Sulphatis ℈i
Confect: Ros: canin: q. s, - - - O

ut fiat bolus, ex pauxillo Infus: Anthemid: - C
hauriendus. Post quamlibet vomitionem superbibantur cyathi aliquot infusi ejusdem tepidi.

---

67. ℞. Tabaci Foliorum ℥j
Aquæ fontis, q. s. - - - - N

Simul contunde, ut fiat epithema, regioni epigastricæ admovend:

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68. ℞. Cupri Sulphatis gr. x.—℈j
Aquæ distillatæ f℥ij - - - - N

Fiat pro hausto emetico.

CATHARTICS.

69. ℞. Magnesiæ Sulphatis - - - - -
et **B**
Sodæ Sulphatis āā ʒiij - - - - -
Aquæ Menthæ Viridis f℥vss - - - **NO**
Liquor: Antimon: Tart: fʒj - - **C**

Fiat Mistura, de qua sumr. Cochl: duo ampla ter quotidie.

---

70. ℞. Infusi Sennæ f℥j
Tinct: Sennæ - - - - - -
et **B** **EB**
Tinct: Jalapæ āā fʒj - - - - -
Potassæ Tart: ʒj - - - - - - **FE2**
Syrup: Sennæ fʒj - - - - **AO**

Fiat Haustus, summo mane sumendus.

---

71. ℞. Extract: Colocynth: comp: ʒj
Opii puri gr. iij - - - - - - **G**
Olei nucis Moschat: ♏iv - - - **E**

Fiat massa in pilulas xii dividend: e quibus capiat duas, omni hora, donec bis dejecerit alvus.

---

72. ℞. Magnesiæ Sulphat: - - - - -
et **B**
Sodæ Sulphat: āā ℥ss - - - - -
Ferri Sulphat: gr. v - - - - - **G**
Misturæ Camphoræ f℥viiss - - - **LO**

Fiat mistura, de qua sumantur Cochl: duo ampla bis indies.

---

73. ℞. Jalapæ Radicis contrit: gr. xv
Hydrarg: Sub-muriat: gr. v - - **F**
Confect: Ros: canin: q. s. - - - **NO**

ut fiat bolus.

CATHARTICS.

74. ℞. Confect: Sennæ ℥iss
Sulphur: Præcipitat: ʒss - - - - **G**
Syrup: Ros: q. s. - - - - **NO**

ut fiat Electuarium, de quo, ad nucis Moschatæ magnitudinem capiatur, ter vel quater quotidie, donec alvus commode purgetur.

In Hæmorrhoids.

---

75. ℞. Olei Ricini f℥ss
Vitelli Ovi, q. s. - - - - - - **O**
tere simul, et adde
Syrup: Papaveris fʒij - - - - } **B** { **G**
Tinct: Opii ♏v - - - - - }
Aquæ distillatæ f℥j - - - - **L**

Fiat Haustus tertiis vel quartis horis sumendus.

In Cholic from Lead.

---

76. ℞. Magnesiæ Sulphatis ʒvj
Infusi Sennæ f℥iss - - - - - **FL**
Tinct: Jalap: fʒj - - - - - **EF**
Tinct: Opii ♏x - - - - - } **F** { **G**
Tinct: Castorei fʒj - - - - - }

Fiat Haustus, ut supra, dandus.

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77. ℞. Infusi Sennæ f℥ij -
Sodæ Tartariz: ʒvj - - - - **FB**
Aquæ Cinnamomi f℥ss - - - - **EO**

Fiat solutio, duabus vicibus, sumenda.

CATHARTICS.

78. ℞. Aloës Spicat: ℈j
Scammoneæ gr. xij - - - - - **B** } **F**
Extract: Rhei ℈ij - - - - -
Bacc: Capsici pulv: gr. vj - - -
Olei Caryophyll: ♏v - - - - - **B** } **Gt**

Fiant Pilulæ xvj, e quibus sumantur binæ, hora decubitus, p. r. n.

---

79. ℞. Pil: Hydrarg:
et
Aloes Spicat: āā ℈j - - - - **G**

Fiat Massa in Pil: vj dividend: e quibus sumantur binæ, h. s.

---

80. ℞. Pulv: Aloes comp: ʒj
Pulv: Antimon: gr. v - - - - - **C**
Saponis duri gr. x - - - - - - **LNO**
Decoct: Aloes comp: q. s. - - - **Oa**

Fiat Massa in Pilulas xx dividend: e quibus capiantur binæ ad alvum officii immemorem excitandam.

---

81. ℞. Extract: Colocynth: comp: gr. xxiv
Pil: Aloes cum Myrrha ʒj - - - **F** } **F**
Hydrarg: Sub-muriat: gr. xv - -

Fiat Massa in Pil: xx dividend: e quibus sumantur una vel altera, p. r. n.

---

82. ℞. Sodæ Sub-carbonat: (*cryst:*) ʒiiss - -
Potassæ Super-tart: ʒiij - - - - **K** } **I**
Aquæ puræ f℥viij - - - - -

Stent in lagena bene obturata per triduum, et deinde sit in promptu pro potu cathartico.

Young.

Medical Literature, p. 455.

CATHARTICS.

83. ℞. Scammoneæ gr. v
Pulv: Rhei gr. xv - - - - -
Ammoniæ Sub-carbonat: gr. v - - -
Fiat Pulvis, ex vehiculo aliquo idoneo sumendus.

---

84. ℞. Pulv: Jalap: gr. xv
Pulv: Ipecac: gr. v - - - - -
Olei Cinnamom: ♏ ij - - - - -
Fiat Pulvis, ut supra, dandus.

---

85. ℞. Pulv: Rhei gr. xv
Potassæ Super-sulphat: gr. x - - -
Aquæ Cinnamomi f℥j - - - - -
Fiat Haustus.

---

86. ℞. Sodæ Tartarizat: ʒij
Sodæ Carbonat: ℈j - - - - -
Aquæ Puræ f℥iss - - - - -
Fiat Haustus, cum Cochl: uno amplo Succi
Limonum - - - - - - - - -
In impetu effervescentiæ sumendus. Quotidie mane.

---

87. ℞. Sodæ Carbonatis ʒij - - - - -
Ferri Sulphat: gr. iij - - - - -
Magnesiæ Sub-carb: ʒj - - - -
Aquæ puræ oss - - - - - -
Acidi Sulphurici dilut: f℥x - - -

Infundatur primum lagenæ aqua, deinde immitantur Salina, et denique Acidum Sulphuricum; illico obturetur lagena, et in loco frigido servetur.

Note.—The decompositions which take place in this formula are described

in the Essay on the Art of Prescribing, p. 207. There is, however, a precaution respecting the proportion of Sulphuric acid which it is essential to remember, viz.—that it should never be added in excess; for in that case the Sulphate of Iron would not undergo the necessary decomposition.

---

88. ℞. Hydrarg: Sub-muriat: gr. x.
Pil: Cambogiæ comp: - - -
et Extract: Colocynth: comp: āā gr. xv - - - - - - **F** } **F**
Syrup: Zingib: q. s. - - - - **E**

ut fiant Pillulæ xij, e quibus sumantur binæ, hora decubitus, vel summo mane, ad alvum officii immemorem excitandam.

---

89. ℞. Cambogiæ Contritæ gr. iij
Sacch: purificat: ℈j - - - **MOE**

Tere optime simul, ut fiat Pulvis, tertia quaque hora sumendus, donec alvus commode purgetur.

---

90. ℞. Foliorum Sennæ ʒiij
Sodæ Sulphat: ℥j - - - - - **F**
Aquæ fervent: oj - - - - **LNO**

Infunde, et cola, ut fiat Enema.

---

91. ℞. Resinæ Terebinthinæ f℥ss
Vitelli ovi, q. s. - - - - - **M**
tere optime simul
Infus. Lini f℥x - - - - **NO**
fiat Enema.

CATHARTICS.

92. ℞. Potassæ Super-tart: ℥ij
Ferri Tartarizat: ʒiij - - - - **G**
Zingib: ℈j - - - - - - **E**
Syrup: Simp: - - - - - **O**
cujus satis sit—dosis ʒij ter die.

93. ℞. Confect: Sennæ ℥ij
Ferri Tartarizat: ℈ij - - - - - **G**

Fiat Electuarium, ad nucis moschatæ magnitudinem sumendum.

EMENAGOGUES.

94. ℞. Sabinæ Foliorum exsiccat:
Zingib: rad: contus: āā ℈ss - - - **E**
Potassæ Sulphatis ʒss - - - - **GM**
M. Fiat Pulvis bis die sumendus.

95. ℞. Myrrhæ pulv: ℈j
Ferri Ammoniati gr. vj - - - - **G**
tere simul et adde

Syrup: Zingib: q. s. ut fiat Electuarium, de quo sumatur ad myristicæ nuclei magnitudinem bis quotidie.

96. ℞. Mist: Ferri comp: f℥ss
Aquæ Cinnamomi f℥j - - - - - **O**
Ft. Haustus bis de die sumendus.

EMENAGOGUES.

97. ℞. Tinct: Ferri Muriatis
Tinct: Aloes comp: āā f℥ss - - - **G1**
Tinct: Castorei fʒij - - - - **G2**

M. de qua sumatur cochl: unum minimum ex cyatho Infus: Anthemid: Flor: ter quotidie.

Emmenagogue and *Antispasmodic.*

---

98. ℞. Pil: Aloes cum Myrrha
et
Pil: Galbani comp: āā ʒj - - **B**

Divide in Pil: xxiv, e quibus sumantur binæ bis quotidie.

---

99. ℞. Pil: Aloes cum Myrrha
et
Pil: Ferri comp: āā ʒj - - - - **G1**
Sodæ Sub-Carbonatis ℈j - - - - **G 2**l.

Divide Massam in Pilulas xxx, e quibus sumantur binæ bis quotidie.

DIURETICS.

100. ℞. Scillæ Radicis exsiccat: gr. iij
Pulveris Opii gr. ss - - - - - - **CE**
Cinnamomi Corticis gr. x - - - - **EO**

Fiat Pulvis bis quotidie sumendus.

---

101. ℞. Potassæ Sub-carbonatis gr. x
Infus: Gentian: comp: f℥iss - - - **CN**
Spir: Etheris comp: fʒss - - **B** } **GE**
Træ Cinnamomi fʒi - - -

Fiat Haustus:

Diuretic and Stimulant.

102. ℞· Scillæ Radicis exsiccat: gr. xij
Potassæ Nitratis ʒi - - - - - **F**
Sacchari purificat: - - - - }
et Cinnamomi cort: contrit: - - **B** } **ME**

āā ʒi. fiat pulvis in sex partes æquales dividend. Sumatur una bis indies.

---

103. *℞· Scillæ Rad: exsiccat: gr. iv
Digitalis Foliorum gr. x - - - - **B**
Hydrargyri Sub-muriat: gr. vj - - - **C**
Myrrhæ Pulv: ℈i - - - - }
simul tere et adde **B** } **G**
Asafœtidæ ʒss - - - - }
Extract: Gentian: q. s. - - - - **CO**

Fiat massa in Pilulas xv dividend: e quibus sumatur una, nocte maneque.

---

104. ℞. Massæ Pil: Scillæ ʒi
Hydrarg: Sub-muriat: gr. v - - - **C**

Fiat massa in Pilulas xv dividenda, quarum sumantur duæ singulis noctibus.

---

* This formula is introduced as a combination supported by authority, although it may be questioned whether its adoption can be sanctioned upon principle. Let us decypher the intention of the different ingredients by their Key Letters. The basis is Squill, to which Digitalis is added, for the purpose we perceive of acting in unison with it, and Calomel, which succeeds it, is intended to promote and direct the diuretic Basis; two fœtid gums next present themselves to our notice, and these are shown by the bracket to exert a combined action, depending, as the Key Letter announces, upon the medicinal similarity, but acting in the general scheme of the formula, as shown by the exterior letter, for the purpose of fulfilling a second indication, distinct and different from that which the Basis is designed to answer, i. e. to produce not a diuretic, but an antispasmodic and stimulant effect; an important question then arises for our consideration.—Is the latter part of the formula consistent with the former, or is the stimulant effect of the Gums compatible with the sedative operation of Digitalis?

DIURETICS.

105. ℞. Sodæ Carbonat: exsiccat: ʒi
Saponis duri ℈iv - - - - - **NB**
Olei Juniperi - - - - - **FB**
Syrupi Zingiberis q. s. - - - - **EN**

Fiat massa in Pilulas xxx dividenda, e quibus capiat tres, indies, contra calculos renum.

Beddoes.

---

106. ℞. Scillæ Radicis exsiccat: gr. ij
Pilulæ Hydrargyri gr. v - - - - **GC**
Opii gr. ss - - - - - - **EC**

Fiat Pilula hora decubitus per tres vel quatuor noctes consequentes capienda.

---

107. ℞. Potassæ Sub-carbonat: ℈i
Succi Limonum f℥ss, vel q. s. - -
Aquæ Cinnamomi f℥i - - - **I** } **K**
Aceti Scillæ fʒiss - - - - - - **B**
Tinct: Opii ♏v - - - - - **C**
Syrupi Aurantii fʒss - - - - - - **O**

Fiat Haustus bis indies sumendus.

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108. ℞. Potassæ Acetatis ʒi
Oxymel: Colchici fʒij - - - - - **B**
tere simul cum aquæ puræ f℥i - - - **N**
Spir: Juniperi comp: f℥ss . - - - **BO**

Fiat Haustus, ut supra dandus.

---

109. ℞. Baccarum Juniperi contus: ʒij
Semin: Anisi contus: ʒij
Aquæ ferventis oj

Macera per tres horas, dein cola.

℞. Colaturæ fʒxij - - - - - A}
Spir: Junip: comp: f℥ij - - - }
Træ Scillæ fʒi - - - - - B
Potassæ Nitratis ℈ij - - - - - - F

Fiat Mistura, de qua sumatur cyathus subinde.

110. ℞. Infus: Digitalis f℥iv - - - - A}
Træ Digitalis fʒss - - - - - - }
Potassæ Acetat: ʒi - - - - - - B
Tinct: Opii ♏v - - - - - - CE

Fiat Mistura, de qua sumatur coch: unum amplum bis terve indies.

111. ℞. Liquoris Ammoniæ Acetat: f℥i
Potassæ Acetatis ʒi - - - - - B

Fiat Haustus ter quotidie sumendus.

112. ℞. Potassæ Supertartratis ℥i
Pulveris Scillæ exsiccat: gr. iij - - B
Pulveris Zingiberis gr. v - - - - - E

Fiat pulvis, sexta quaque hora capiendus.

113. ℞. Spartii cacum: concis: ℥i
Aquæ puræ oj

Decoque ad octarium dimidium, et cola.

℞. Colaturæ f℥i
Spir: Etheris Nitrici ♏x - - - BE

Sumatur alternis horis.

DIURETICS.

114. ℞. Tinct: Ferri Muriat: ♏ xv
Infus: Quassiæ f℥i - - - - - **CN**
Fiat Haustus tertia quaque hora sumendus.

---

115. ℞. Potassæ Nitratis ʒi
Misturæ Ammoniaci f℥vj - - - - **N**
Spir: Juniperi comp: f℥iss - -
Aceti Scillæ fʒvj - - - - **B** } **BE**
Fiat Mistura de qua capiat cochl: j amplum quartis horis.

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116. ℞. Tincturæ Lyttæ ♏ x
Spiritus Ætheris Nitrici fʒi - - - **F**
Misturæ Camphoræ fʒxij - - - **EN**
Syrup: Zingiberis fʒi - - - - **EO**
Fiat Haustus ter in die sumendus.

A highly stimulating diuretic.

DIAPHORETICS.

117. ℞. Misturæ Camphoræ f℥iss
Liquor: Ammon: Acet: f℥ss - - - **F**
Liquor: Antimonii Tart: ♏ xx - -
Tinct: Opii ♏ x - - - - - **H** } **B**
Fiat Haustus.

---

118. ℞. Potassæ Sulphureti gr. xv
Saponis duri ʒj - - - - - **EL**
Balsam: Peru: q. s. - - - - **O**
Ut ft: Pilulæ xxx; sumat tres quarta quaque hora ex cyatho Infusi calidi Juniperi baccarum.

In Cutaneous Affections.

DIAPHORETICS.

119. ℞. Pulveris Antimon: ʒss - - - -
Opii Pulv: ℈ss - - - - - **H**
Hydrargyri Sub-muriat: gr. v - - -
Confect: Opii q. s. - - - - - - **OB**

Ut fiant Pilulæ decem, quarum capiat unam hora decubitus, et repetatur p. r. n.

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120. ℞. Pulveris Ipecacuanhæ comp: gr. xv
Pulv: Trag: comp: ℈ij - - - - **N**

Divide in partes quatuor æquales, quarum sumat unam quavis horâ.

---

121. ℞. Pulv: Ipecacuanhæ comp: gr. xv
Pulv: Antimon: gr. ij - - - - **B**

Ft: pulvis hora decubitus sumend: superbibendo Haustulum tepidum.

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122. ℞. Guaiaci gum-resinæ gr. x
Pulv: Ipecacuanhæ comp: gr. v - - **F**
Confect: Rosæ q. s. - - - - **O**

Ut fiat Bolus, h. s. sumendus.

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123. ℞. Potassæ Carbonatis gr. x - - - -
Mist: Camphoræ f℥j - - - - **IK**
Ft: Haust: cum Succi Limonum - - -

Cochleari uno amplo, in impetu ipso effervescentiæ sumendus.

DIAPHORETICS.

124. ℞. Guaiaci Resinæ gr. x
Antimonii Tart : - - - - - -
et H { B
Opii puri āā gr. j - - - - - -
Syrupi q. s. - - - - - - O
Fiat Bolus bis quotidie sumendus.

---

125. ℞. Camphoræ
et Pulvis Antimon : āā gr. iij - - - H { F
Opii puri gr. j - - - - -
Confect : Aromat : q. s. - - - - N
Fiat Bolus, h. s. sumendus.

---

126. ℞. Liquor : Ammoniæ Acetat : fʒij
Decoct : Cinchonæ fʒx - - - - A { G
Tinct : Cinchonæ fʒij - - - -
Confect : Aromat : ʒss - - - - N
Ft. Haustus, tertia vel quarta quaque hora sumendus.

---

127. ℞. Guaiaci Resinæ ʒij
Acaciæ gummi ℥ij - - - - - - M
Simul bene tritis adde
Træ Opii fʒss - - - - - - - C
Pulv : Cinchonæ ʒj - - - - - -
Træ Cinchonæ f℥ij A { G
Decoct : Cinchonæ f℥viij - - - - -
Fiat Mistura cujus sumatur cyathus bis quotidie.
Rheumatism.

---

128. ℞. Extracti Aconiti
Antimonii Sulphureti - - - - -
Præcipitati āā gr. j E { B
Magnesiæ Carbonatis ℈ss - - -
Tere simul ut fiat pulvis.

DIAPHORETICS.

129. ℞. Pulv: Antimon: gr. iij
Potassæ Sub-carbonatis gr. v - - - **E**
Anthemid: Flor: exsiccat: ℈j - - **N**

M. Fiat pulvis sexta quaque hora, per biduum vel triduum, sumendus.

---

130. ℞. Pulveris Ipecacuanhæ gr. ij - - - - **H** }
Pulveris Opii gr. i - - - - }
Potassæ Nitratis gr. xvj - - - - - **MF**

Fiat Pulvis hora somni sumendus.

EXPECTORANTS.

131. ℞. Asafœtidæ ℈ij
trituratione solve in
Aquæ Menthæ vir: f℥iij - - - **N**
addeque Syrup: Tolu: f℥j - - - **G**

Fiat Mistura, de qua sumatur cochl: unum amplum tertia quaque hora.

---

132. ℞. Myrrhæ gum-resin: ʒss
Sacchari purificati ℥ss - - - - - **M**

Tere optime simul ut fiat Pulvis, partitis dosibus quotidie sumendus, in vehiculo aliquo idoneo.

---

133. ℞. Myrrhæ gum-resin: ʒiss
Scillæ exsiccat: ʒss - - - - - **B**
Extract: Hyoscyami ℈ij - - - - **G**
Aquæ q. s. ut fiant Pil. xxx - - - **NO**

E quibus sumantur binæ, nocte maneque.

EXPECTORANTS.

134. ℞. Scillæ exsiccatæ gr. viij
Pulveris Ipecacuanhæ gr. v - - - - **C**
Camphoræ ℈j - - - - - - **G**
Pulv: Antimon: gr. vj - - - - - **C**
Sacch: purificat: ʒj - - - - - **M**

Tere in pulverem, in quatuor partes æquales dividendum. Pars una sumatur bis quotidie, ex haustu decocti hordei.

135. ℞. Oxymel: Scillæ
Syrupi Altheæ - - - - - **B** { **F**
Mucilag: Acaciæ - - - - - -

āā f℥ss, misce et fiat linctus, de quo lambat sæpe.

136. ℞. Misturæ Ammoniac:
et Aquæ Cinnamomi āā f℥iss - - - **N**
Syrupi Tolut: f℥ss - - - - - **NO**
Tinct: Castorei fʒij - - - - - **B** { **G**
Tinct: Opii ♏ v - - - - - -

Fiat Mistura, cujus sumatur Cochl: unum amplum subinde, ac repetatur dosis p. r. n.

Expectorant & Antispasmodic. Hooping Cough, &c.

137. ℞. Mist: Amygdal: f℥j
Vini Ipecacuanhæ ♏ x - - - - **G**
Potassæ Carbonatis gr. x - - - **IK** { **G**
Sumatur cum Succi Limon: fʒiij - - -

In impetu ipso effervescentiæ.

138. ℞. Pulveris Myrrhæ gr. xij
Pulv: Ipecacuanhæ gr. vj - - - - **F**
Pulv: Potassæ Nitrat: ʒss - - - **E**

Misce et divide in doses æquales quatuor, quarum sumat unam quartis horis.

EXPECTORANTS.

139. ℞. Tinct: Scillæ ♏ x
Acid: Nitric: dilut: ♏ vj - - - C
Extract: Hyoscyam: gr. iij - - - G
Aquæ puræ f℥iss - - - - - N
Fiat Haustus tertiis horis sumend:

Bree.

---

140. ℞. Acid: Nitric: fʒj - - - - - - }
Aquæ puræ f℥iv misce - - - - } H
dein tere
Ammoniaci ʒj - - - - - - }
donec emulsio evadit
Dosis cochl: j medioc: ex liquore aliquo demulcenti.

SIALOGOGUES.

141. ℞. Hydrarg: Oxyd: rubri gr. j
Opii tertiam grani partem - - - - C
Caryophyll: olei ♏ j - - - - - B
Fiat pilula, h. s, per hebdomadam sumenda.

J. Hunter.

---

142. ℞. Hydrarg: oxy-muriat:
Ammoniæ muriat: āā gr. v - - - L
Aquæ distillat: fʒss - - - - - N
Glycyrrhizæ rad: contrit: ℈iv - - B } O
Mellis ʒss - - - - - - - }
Cogantur in massam, quam divide in pil: xl, e quibus sumatur una ter die.

SIALOGOGUES.

143. ℞. Pyrethri rad: contrit:
Masticbes āā ʒj - - - - - - MN

Fiant legè artis, ad ignem, masticatoria duo; teneat æger sœpius in ore, et manducet hujusmodi medicamentum, exspuatque salivam.

Hartman.

REFRIGERANTS.

144. ℞. Potassæ Nitratis gr. xv

Ft: Pulv: ex cyatho Aquæ perfrigidæ, illico post solutionem sumend:

145. ℞. Acidi Muriatici fʒj
Decoct: Hordei oj - - - - - N
Syrupi fʒij vel q. s. - - - - - O

ad acorem compescendum, et gustum conciliandum. Sumatur quotidie, instar potus, et bibat quantum sitis exigat.

In Typhus and other Fevers.

146. ℞. Ammoniæ Muriat: ʒij
Acidi Acetici f℥ij - - - - - - B
Spir: Camphor: f℥ss - - - - G

Misce ut fiat Lotio.

147. ℞. Liquor: Plumbi Acetat: fʒj
Acidi Acetici f℥ij - - - - - - L
Spir: tenuior f℥ss - - - - - G
Aquæ distillatæ f℥viij - - - - N

Fiat lotio.

REFRIGERANTS.

148. ℞· Liquor: Ammon: Acetat: f℥vj
Spir: Rosmarini fʒij - - - - G
Aquæ puræ oj - - - - - N

Sit pro Epithemate, capiti raso applicandum.

ANTACIDS AND ABSORBENTS.

149. ℞· Liquoris Potassæ fʒij
Liquoris Calcis f℥vj - - - - FN

M. Cujus capiat æger, acido infestante, cochleare amplum unum, vel alterum, ex poculo jusculi bovini.

150. ℞· Magnesiæ ʒss
Aquæ Menthæ Pip: fʒiiss - - -
Spir: Lav: comp: fʒss - - - B } G
Spir: Carui fʒiv - - - - -
Syrup: Zingib: fʒij - - - -

Sumatur cochleare unum mediocre, p. r. n.

Antacid and Carminative.

151. ℞. Pulv: Cretæ co: cum Opio ℈j
Pulv: Catechu Extract: gr. xv - - G

Sit pulvis, post singulas sedes liquidas sumendus.

In Diarrhœa depending upon Acidity.

152. ℞. Ammoniæ Sub-carb: gr. v
Extract: Rhei gr. viij - - - - GN

Fiat massa in Pil: binas dividenda.

ANTACIDS AND ABSORBENTS.

153. ℞. Magnesiæ Carbonatis gr. v
Sodæ Sub-carb : gr. v - - - - - **B**
Zingib : rad : contrit : gr. iv - - - **E**
Glycyrrhizæ rad : contrit : gr. xv - - **MO**
M. et fiat pulvis, contra cardialgiam.

ANTILITHICS AND LITHONTHRYPTICS.

A. *In the Lithic Acid Diathesis.*

154. ℞. Sodæ Sub-carb : gr. x
Infus : Quassiæ f℥j - - - - - - **GC**
Tinct : Calumbæ fʒj - - - - - **E**
Fiat Haustus bis quotidie sumendus.

155. ℞. Magnes : Sub-carbonat : ℈j
Infus : Calumbæ f℥j - - - -
Tinct : Calumbæ f℥j - - - - **A** } **GC**
Fiat Haustus.

156. ℞. Sodæ Sub-carbonat : gr. x
Mist : Amygdal : f℥j - - - - - **NO**
Balsam : Copaib : (ope mucilag : mist :) fʒss **G1**
Tinct : Opii ♏ v - - - - - - **G2**
Fiat Haustus, urgenti dolore sumendus.

157. ℞. Magnesiæ Sub-Carbonat : gr. x
Pulv : Ipecac : gr. j - - - - - - **G**
Sodæ Sub-carbonat : gr. v - - - - **F**
Fiat Pulvis, ex vehiculo aliquo idoneo sumendus ; superbibendo cyathum Infusi Anthemid : Flor :

ANTILITHICS AND LITHONTHRYPTICS.

B. *In the Phosphatic Diathesis.*

158. ℞. Acid : Muriatic : ♏ v
Decoct : Hordei comp : f℥iss - - - - **N**
Fiat Haustus ter quotidie sumendus.

159. ℞. Infus : Ros : f℥iss
Magnes : Sulphat : ʒj - - - - - **G**
Tinct : Calumbæ fʒij - - - - - **B**
Fiat Haustus.

ANTHELMINTICS.

160. ℞. Pulv : Stanni ℥iij
Confect : Rosæ Gall : ℥ss - -
Syrupi q. s. ut fiat Elect : - - **B** } **N**
Capiat coch : amplum, quotidie mane, et repetatur dosis ad tres vices, et deinde capiat æger Haustum aliquem purgantem.

161. ℞. Cambogiæ gr. viij
Hydrarg : Sub-muriat : gr. v - - - - **F**
Mucilag : Acaciæ q. s. ut fiat Bolus mane sumendus.
Contr Tæniam.

162. ℞. Sodæ Muriatis ℥ij
Coccinell : ℈ij - - - - - - **MO**
Fiat Pulvis, et detur drachma dimidia pro dosi, tempore matutino.

ANTHELMINTICS.

163. ℞ Ferri Carbonatis ℈j
Sumatur ex vehiculo aliquo crasso, singulis auroris.

---

164. ℞ Camphoræ (Alcohole solutæ) ʒj
Ol: Olivæ fʒij - - - - - **LN**
Misce, Fiat Enema.

Injiciatur h. s. tertia quaque nocte, ad tres vices: dein repetatur alternis noctibus, ad quartam usque vicem, si opus sit.

Contra Ascarides.

---

165. ℞ Aloes Soccot: gr. x
Saponis Duri ʒj - - - - - **LN**
Fiat Suppositorium post Alvum exoneratam applicand.

DEMULCENTS.

166. ℞ Olei Amygdal: f℥j
Acaciæ gummi ʒiij - - - - - **MN**
tere simul, et dein gradatim adde
Aquæ distillatæ f℥vi - - - - - **O**
Syrup: Rhæados f℥ss - - - - - **O**
Fiat Mistura, de qua sumantur Cochlearia duo ampla, ter quaterve, indies.

---

167. ℞ Olei Amygdal: fʒvj - - - - - **I** }
Liquoris Potassæ ♏L - - - - - }
Aquæ Rosæ f℥viiss - - - - - **N**
Fiat Mistura, ut supra capienda.

DEMULCENTS.

168. ℞. Mistur: Amygdal: f℥j - - - -
Potassæ Carbonatis gr. x **IK**
Syrupi Rhæados f℥j
Ft: haust: cum cochl: Succ: Limon: - -
in impetu effervescentiæ sumend:
Demulcent & Febrifuge.

---

169. ℞. Pulv: Cetacei
Pulv: Trag: comp: āā ℥ss - - - **B**
Syrupi Papaveris q. s. - - - - **NO**

Misceantur, et fiat Linctus. Dosis cochl: minimum subinde.

---

170. ℞. Cetacei ʒij
Pulv: Trag: comp: ʒj - - - -
Syrup: Papaveris
Syrup: Tolu: āā fʒij . **B** **B**
Confect: Ros: ʒvj - - - - - -
Potassæ Nitratis ʒss - - - - **G**

Fiat Electuarium, de quo capiat ad nucis moschatæ magnitudinem.

---

171. ℞. Cetacei ʒij
Vitelli ovi dimidium - - - - -
Syrupi f℥ss
Aquæ Cinnamomi f℥ij **B**
Aquæ distillatæ fʒiv - - - - -

Fiat Mistura, de qua capiat æger cochleare amplum frequenter.

DEMULCENTS.

172. ℞. Amyli ʒiij
Aquæ ferventis f℥iv - - - - - - L
Solve pro enemate, et adde,
si opus fuerit,
Tinct: Opii fʒss - - - - - - G

---

173. ℞. Decoct: Lichenis oss
Sumatur quotidie, cochleatim,
instar potus communis.

FINIS.

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